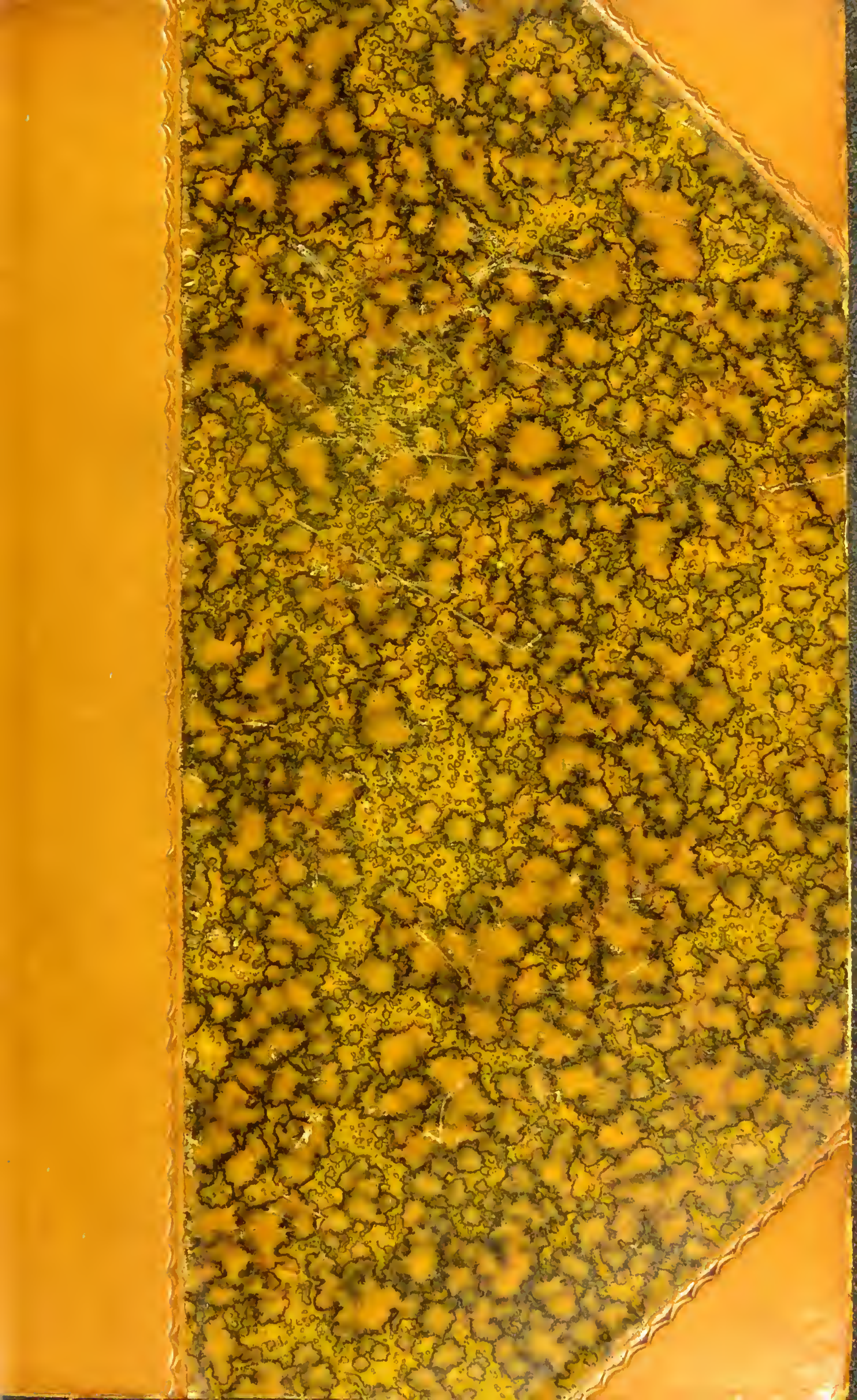

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PHARMACOGRAPHIA INDICA.

INDEX

AND

APPENDIX

TO THE

PHARMACOGRAPHIA INDICA,

BY

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C. J. H. WARDEN.
DAVID HOOPER.

July, 1893.

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APPENDIX.

RANUNCULACEÆ.

On the Crystalline Alkaloid of Aconitum Napellus.*

Messrs. Wyndham R. Dunstan and W. H. Ince, Ph.D., have investigated the properties of a crystalline alkaloid obtained from the root of *Aconitum Napellus* by extraction with amyl alcohol, as suggested by the late Mr. John Williams (*Pharm. Journ.* [3], xviii., 238). For a supply of the material they are indebted to the kindness of Messrs. Howards & Sons, of Stratford.

The yellowish indistinct crystals melted at 188·4° (corr.), and by crystallization from alcoholic solution were proved to be associated with a small quantity of a gummy amorphous base. On combustion the original substance gave numbers agreeing fairly well with the formula $C^{33}H^{43}NO^{12}$, which is that proposed for aconitine by Wright and Luff (*Journ. Chem. Soc.*, 1879). The alkaloid was purified by repeated crystallization from a mixture of alcohol and ether, or more readily by conversion into its hydrobromide and regeneration of the alkaloid from this salt or by regeneration from its crystalline aurochloride. It crystallizes in tabular prisms belonging to the rhombic system; the crystallography of the substance has formed the subject of a separate inquiry by Mr. Tutton. The crystals are very slightly soluble in water and light petroleum, more soluble in ether and alcohol, most soluble in benzene and chloroform. They melt at 188·5° (corr.). Contrary to the statements of previous observers, who found aconitine to be lævo-rotatory, the authors found an alcoholic solution to be *dextro-rotatory* $[\alpha]_D +$ 10·78°; the aqueous solution of the hydrobromide is, however, lævo-rotatory $[\alpha]_D$—30·47°. On analysis, the pure alkaloid afforded results which agreed best with the formula $C^{33}H^{45}NO^{12}$.

Two crystalline *aurochlorides* were obtained. One ($C^{33}H^{45}NO^{12}$ $HAuCl^4$), melts at 135·5° (corr.); the other, a basic aurochloride ($C^{33}H^{45}NO^{12}AuCl^3$), melts at 129° (corr.). These compounds are obtained without difficulty, and afford trustworthy means of

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[*] The substance of a communication made to the Chemical Society, March 19, 1891.

identifying aconitine. The alkaloid may be readily recovered from them in a pure state.

Aconitine is not appreciably affected by heating at a temperature below its melting point, but at this temperature it is gradually converted into the uncrystallizable base aconine. Prolonged boiling in aqueous solution induces a similar change, but not to the same extent, unless an alkali is present. Boiling with water acidulated with hydrochloric acid also produces decomposition of the alkaloid.

Dehydraconitine or *apoaconitine* is a base differing from aconitine by the absence of a molecular proportion of water, which was first obtained by Wright and Luff by acting on aconitine with acids. Its existence has, however, been questioned by later workers. The authors find that such a substance may be readily procured by heating aconitine with saturated aqueous tartaric acid in closed tubes, as recommended by Wright and Luff. The crystals of this substance melt at 186·5° (corr.). It forms crystalline salts, and in other respects closely resembles the parent alkaloid. The results of analyses agree well with the formula $C^{33}H^{43}NO^{11}$. Three *aurochlorides* were obtained. One ($C^{33}H^{43}NO^{11}HAuCl^{4}$) melts at 141° (corr.). This salt, when crystallized from aqueous alcohol, becomes a hydrate—

$$(C^{33}H^{43}NO^{11}HAuCl^{4}H^{2}O),$$

melting at 129° (corr.), isomeric with aconitine aurochloride, into which, indeed, it very readily changes. The third aurochloride is a direct compound of the alkaloid with auric chloride ($C^{33}H^{43}NO^{11}AuCl^{3}$); it melts at 147·5° (corr.).

An *amorphous base* was obtained from aconitine, together with benzoic acid, by prolonged heating with water in a closed tube. It appears to be identical with the *aconine* of Wright and Luff. The same substance is formed together with a resinous substance when aconitine is heated with an alkali. Neither aconine nor its salts could be crystallized. The amorphous base, after purification, and its amorphous aurochloride, afforded analytical data agreeing respectively with the formulæ $C^{26}H^{41}NO^{11}$ and $C^{26}H^{41}NO^{11}HAuCl^{4}$.

The Alkaloids of True Aconitum Napellus.

Professor Dunstan and Mr. John C. Umney have examined the alkaloids of true *Aconitum Napellus* plants grown by Mr. E. M. Holmes, at the instance of the British Pharmaceutical Conference.

The alkaloids were extracted from the root by the following process, which precludes the possibility of the occurrence of hydrolysis, &c. :—The solution obtained by percolating with cold rectified fusel oil (b. p. 100 – 132°) was agitated with water acidified with 1 per cent. of sulphuric acid, and the resin having been removed by extracting the acid solution so obtained with chloroform, the liquid was made just alkaline with dilute ammonia and extracted with ether, which dissolved out a considerable quantity of alkaloid, but left in solution a further and smaller quantity, which was subsequently extracted by agitation with chloroform. The *alkaloid soluble in ether* was obtained as a gum-like mass incapable of crystallization. By conversion into bromhydride it was separated into a crystallizable and an uncrystallizable salt.

The crystalline product was identified as the salt of aconitine, the crystalline and highly toxic alkaloid already described by one of the authors and Dr. W. H. Ince (*C. S. Trans.*, 1891). The alkaloid separated from the pure bromhydride melted at 188·5° (corr.), and afforded on combustion numbers agreeing with the formula $C^{33}H^{45}NO^{12}$. The specific rotation of the bromhydride in aqueous solution was ascertained to be $[\alpha]_D$—29·65, a value which agrees with that previously recorded. As some doubt exists as to the solubility of aconitine in water, a determination was carefully made with this pure specimen. The mean of two determinations gave 1 gram in 4,431 grams of water as the solubility at 22°; Jürgens had previously recorded the far greater solubility of 1 in 745 at the same temperature.

The non-crystalline bromhydride furnished a gummy alkaloid soluble in ether and alcohol, but only sparingly soluble in water, the aqueous solution being alkaline to litmus, and very bitter, but not giving rise to the tingling sensation so characteristic of aconitine. Not only the alkaloid, but also the chlorhydride, sulphate, nitrate and aurichloride prepared from it could not be crystallized. This alkaloid is not identical either with aconine or with the picraconitine of Wright and Luff. A full account of it will be given in a later paper, considerable progress having already been made in the most difficult task of isolating it in a pure state. The authors propose to assign to it the name *napelline*, which was first given to the alkaloid now known as pseudaconitine, and afterwards by Hübschmann to a substance which the work of Wright and Luff showed to be a mixture chiefly composed of aconine. The napelline obtained in the manner described is probably associated with another amorphous alkaloid about which they have at present little information to give beyond the fact that neither it nor its salts appear to crystallize.

The *alkaloid soluble in chloroform* was proved to be *aconine*, the compound which is obtained together with benzoic acid on hydrolysing aconitine.

The roots of true *Aconitum Napellus*, therefore, must be held to contain three alkaloids, one of which is crystalline, *viz.*, aconitine, two being amorphous, *viz.*, napelline and aconine. Indications have been obtained of the presence of a fourth alkaloid, which is amorphous and closely resembles napelline.

The authors find that the juice expressed from the roots contains a large proportion of amorphous bases but very little aconitine, the greater part of this latter remaining in the root, from which it may be extracted, together with the remainder of the amorphous alkaloids, by exhausting with amyl alcohol. The total quantity of amorphous alkaloid obtained amounted to more than twice that of aconitine.

The physiological action of the alkaloids referred to is being investigated. The results so far obtained point to the conclusion that crystalline aconitine is by far the most toxic of the alkaloids contained in *Aconitum Napellus*.

The formation and properties of Aconine and its conversion into Aconitine.

Owing to the uncertainty which exists with reference to the product of the hydrolysis of aconitine, Professor W. R. Dunstan and Dr. F. W. Passmore have re-investigated the subject, using a pure alkaloid. Wright and Luff have stated that when aconitine is hydrolysed, the sole products are aconine and benzoic acid. More recently, however, Dragendorff and Jürgens have asserted that the hydrolysis occurs in two stages, their contention being that benzoic acid and an alkaloid identical with the picraconitine isolated by Wright and Luff from the roots of supposed *Aconitum Napellus* are formed in the first stage, while in the second stage the picraconitine is hydrolysed into benzoic acid, methyl alcohol, and aconine, which last is the final product of hydrolysis.

The authors have carefully hydrolysed pure aconitine by heating it with water in closed tubes at 150°, but have been unable to obtain at any stage either picraconitine or methyl alcohol. The alkaloid extracted from the solution by ether was proved to be a mixture of aconine with unaltered aconitine. Using pure aconitine, action occurs precisely in accordance with the equation $C^{33}H^{45}NO^{12} + H^2O = C^{26}H^{41}NO^{11} + C^7H^6O^2$, leaving little doubt that aconitine is benzoylaconine.

Although attempts to establish the correctness of this inference by heating aconine with benzoic anhydride were without result, anhydroaconitine was eventually obtained by the interaction of aconine and ethylic benzoate at 130°: as the anhydro-compound is convertible into aconitine, the partial synthesis of the alkaloid thus effected leaves no doubt that it is benzoylaconine.

Up to the present time, neither aconine nor its salts have been obtained in a crystalline state. The authors have hitherto been unsuccessful in all their attempts to crystallise aconine, but they have succeeded in crystallising several of its salts, *viz*, the chlorhydride, bromhydride, sulphate, and nitrate. All these salts are very soluble in water, the chlorhydride being least soluble and the easiest to crystallise: it is best prepared by crystallisation from a mixture of alcohol and ether; when dried at 100° it melts at 175·5° (corr.). The crystals deposited from alcohol have the composition $C^{26}H^{41}NO^{11},HCl,2H^2O$. When dried at 100° they still retain one molecular proportion of water, which is, however, lost at 120°. The aqueous solution is lævo-rotatory: $[\alpha]_D = -7{\cdot}71°$. It combines with auric chloride, forming an aurichloride considerably more soluble than the corresponding aconitine salt.

Aconine was prepared from the pure chlorhydride by adding silver sulphate and subsequent treatment of the aconine sulphate with exactly sufficient baryta water. The solution on evaporation furnished a hygroscopic, brittle gum which refused to crystallise; this melted at 132° (corr.), and on analysis it afforded numbers agreeing with the formula $C^{26}H^{41}NO^{11}$, which is that proposed by Dunstan and Ince from the results of their study of pure aconitine. Aconine is very soluble in water; the aqueous solution is alkaline. When dry it is insoluble in ether and almost insoluble in chloroform. It is a powerful reducing agent, precipitating the metals from solutions of gold and silver salts; it also reduces Fehling's solution. The physiological action of pure aconine is being investigated. Its aqueous solution is slightly bitter and gives rise to a burning sensation in the mouth, but does not produce the tingling which is characteristic of aconitine. In respect of its action on polarised light, aconine exhibits the same peculiarity as aconitine. Its salts are lævo-rotatory, whilst a solution of the alkaloid is dextro-rotatory, $[\alpha]_D + 23°$. When heated with alkalis, aconine slowly resinifies.

The action of various re-agents on aconine has so far not led to any important results. Nitrous acid fails to attack it. The principal product of its oxidation by alkaline permanganate is oxalic acid. Attempts to isolate an additive compound with methyl iodide have been unsuccessful.

By the action of methyl iodide on aconitine a crystalline *aconitine methiodide* ($C^{33}H^{45}NO^{12} \cdot CH^3I$) was obtained, which melts at 219° (corr.). The *aconitine methhydroxide* prepared from the compound ($C^{33}H^{45}NO^{12} \cdot CH^3OH$) is amorphous, and the salts which it yields do not appear to crystallise. A further study will be made of this compound, and its physiological action will be investigated.

Professor Dunstan, in conjunction with Messrs. Harrison and Carr, has continued his investigation of the aconite alkaloids, and the results were communicated to the Chemical Society, February 2, 1893. It was discovered that aconite root contains an amorphous alkaloid, napelline, which is isomeric with aconitine, but has a distinctly different physiological effect, and is not nearly so poisonous. In an examination of some commercial specimens of aconitine, the authors found large proportions of amorphous alkaloids present, and specimens of aconitine salts were found, in nearly every case, to be chiefly napelline salts containing small quantities of aconitine compounds.

The Aconites and Aconitines.

E. Richards and F. A. Rogers arrive at the following conclusions :—

The best material for the preparation of aconitine is the fresh root of *Aconitum Napellus.*

The alkaloid resides chiefly in the cambium layer, the fibro-vascular bundles, and the sieve ducts.

Pure aconitine crystallizes in thin, flat, hexagonal prisms with acute ends.

It is probable that two isomeric forms of aconitine exist ; for these the terms α-aconitine and β-aconitine are suggested.

The composition of aconitine corresponds to the formula $C^{33}H^{43}N^{2}O^{12}$, which contains twice as much nitrogen as the formula hitherto accepted.

The proportion of alkaloid in the root is as follows :—

	Per cent.
Aconitum Napellus, fresh	0·71
„ „ dried	0·14
Japanese aconite „	0·57

The method for the preparation of aconitine, recommended by the authors, is as follows :—

The powdered tubers are macerated from three to four days with washed fusel oil, then percolated, and the alkaloid extracted from the percolate with small quantities of dilute sulphuric acid. The fusel oil is removed from this solution by treatment with ether, and the dissolved ether driven off by heat. The alkaloid is precipitated from the acid solution by solution of sodium carbonate, collected on a strainer, pressed between limestones, and then spread on bibulous paper and allowed to dry at ordinary temperature. The dried alkaloid is then boiled with pure dry ether, and the filtrate set aside to crystallize; the crystals are redissolved in a small quantity of ether to remove a gum-like body.

The toxicity of α-aconitine is stated to be only one-sixth of that of β-aconitine. (*Chemist and Druggist*, Feb. 7, 1891, 205, and Feb. 15, 1891, 242, 243.)

Ehrenberg and Purfürst infer from their experiments with aconitine that its composition is more correctly represented by the formula $C^{32}H^{43}NO^{11}$, than by that assigned to it by Wright and Luff ($C^{32}H^{43}NO^{12}$), or Dunstan and Ince ($C^{32}H^{45}NO^{12}$). They state that by heating with water to 150° C., or by treatment with alcoholic potash, aconitine does not at once yield benzoic acid and aconine; but that, in addition to benzoic acid, methylic alcohol and another acid are produced. The authors state that by boiling aconitine with water there is at first produced a salt of a new base, which crystallizes when the liquid cools, and this product is described by them as benzoate of picraconitine. This is represented as being formed by simple hydrolysis—

$$C^{32}H^{43}NO^{11}+H^{2}O=C^{25}H^{30}NO^{10}+C^{7}H^{3}O^{2}.$$

By continuing the boiling a further alteration is effected according to the equation—

$$C^{25}H^{3}NO^{10}+H^{2}O=C^{24}H^{37}NO^{10}+CH^{3}OH.$$

Picraconitine. Napelline. Methyl alcohol.

The formation of aconine is represented as constituting a third stage of alteration as follows :—

$$C^{24}H^{37}NO^{10}+H^{2}O=C^{22}H^{35}NO^{9}+C^{2}O^{4}H^{2}.$$

Napelline. Aconine. Acetic acid.

The authors suggest that it is still doubtful whether the acid product of this final change is acetic acid or acrylic acid, and that, in the latter case, the formula of aconine would be $C^{21}H^{35}+NO^{9}$.

From the production of mehtyl alcohol in the decomposition of aconitine when heated with water, it is inferred that aconitine is analogous to cocaine, and is to be classed with the acid esters, either as an acetyl or an acryl ester of benzoyl aconine, while aconine itself would be a derivative of a trimethoxylmethyl quinone. (*Journ. f. prakt. Chem.*, xlv., 604.)

Note on Mishmee Teeta and Bee (or Poison).

These roots are procured on the range of hills inhabited by the Mishmee tribe, and annually in the cold season a large supply is brought down to the plains, and the Mahajans here, who are principally Marwar people, give in exchange for them beads, salt, coloured woollen and cotton cloths, &c., &c. The Mahajans state that these articles are readily purchased in Central and Lower Assam.

The Natives here use the Teeta as a medicine in colic, ophthalmia, headache, and fever.

The *Bee* or poison, which is brought down by the hill-tribes, is parboiled with a view to prevent its cultivation in the plains. It is generally employed by hunters for killing wild animals.

Mishmee Teeta as a remedy for Colic.—Take 20 grains of Mishmee Teeta, 10 to 12 whole grains of black pepper, about 10 grains of salt. The whole is to be masticated and washed down with a small quantity of water.

Mishmee Teeta as a remedy for Ophthalmia and Headache.—Take 2 drachms of Mishmee Teeta and grind it with sufficient water to form a paste, which is to be applied round the eye twice a day. For headache it is applied to the forehead and temples.

Mishmee Teeta as a remedy in Fever.—Take 1 drachm Mishmee Teeta finely powdered, and mix with half a pint of cold water. To be taken daily in two doses. Purgatives are never used by the hill-tribes.

Mishmee Bee (or poison) employed by hunters.—Take 2 or 3 drachms of Mishmee Bee finely ground, and mix with any acid glutinous vegetable pulp, so as to form a thick paste, which is to be applied to the head of the arrow and allowed to dry in the shade.

The glutinous substance generally used is the pulp of a sour fruit called *Owe Tangah* by the Assamese and *Chultah* in Bengali (*Dillenia Speciosa*). I imagine it is preferred in consequence of its acidity preventing a flow of blood from the wound, which would wash away the poison. (*By the Medical Officer, Chyckwah, Upper Assam, June* 11*th*, 1842.)

Delphinium Zalil.

Aitchison (*Notes on Products of W. Afghanistan and N.-E. Persia*, p. 55) says :—"Yellow Larkspur, *asbarg*, *aswarg*, *isbarg*, *isbarag*, *isparak*, *sparak*, *sparig*, *jalil*, *zalil*; the flowers, *gul-i-zalil*, *gul-i-jalil*. A perennial herb, with a thick short woody rootstock, from which several annual shoots spring ; these are from one to two feet in height, each usually bearing a terminal spike of exquisite yellow flowers. When the flowers are at their best, the annual shoots bearing the spike of inflorescence is broken off close to the root; these are collected together, and then laid in heaps, usually on the roofs of the houses, to dry. In two or three days they are sufficiently dry, when the twigs are shaken over a sheet ; on this all the flowers tumble off, and are collected, either for local use or exportation. The petals are of commercial importance, yielding a valuable yellow dye for silk, and are exported for this purpose in large quantities to Persia, Turkistan, Afghanistan, and India. The dye is easily obtained by simply boiling the flowers in water ; in this decoction the silk is dipped. The dried stems also yield a dye upon being boiled, but this is poor in comparison with that yielded by the flowers."

In the *Dict. Econ. Prod. of India*, iii., 70, it is stated that in Multan the flowers are used along with *Akalbér* (*Datisca cannabina*) and alum to dye silk, giving a sulphur-yellow colour known as *gandhaki*, and that they are also used in calico-printing. Their price in the Punjab is said to be Rs. 27·5 per cwt. This dye is alluded to by Mr. Leotard, Dr. McCann, and Mr. Wardle, but under the name of *D. Ajacis*.

The Hellebores of the Ancients.*

Drugs prepared from hellebore were so famous amongst the ancients as a remedy for madness, and, indeed, for many other ailments, that the plant has acquired for itself a literary as well as a botanical interest. Pliny gives a list of them quite worth the notice of advertisers of patent medicines. We know that different species have been used in different countries for their medicinal properties, which are, perhaps, essentially the same in all of them, though varying in strength. The hellebore of the modern English Pharmacopœia is the root of *Helleborus niger*, the common Christmas Rose. In Germany, *H. viridis*, the green hellebore, is said to be preferred, and from its frequent occurrence in England in the neighbourhood of old ruins, we may infer that it was formerly used here. At Constantinople a popular drug, called Zoptane, is made from *H. orientalis*, which is common on the mountains of Eastern Turkey. In Gerard's time, our native *H. fœtidus*, the rankest of all the genus, was employed medicinally, though known to require great caution in using, and it is still retained in veterinary practice for outward application.

The physicians of ancient Greece, who for some centuries before and after the Christian era were famous throughout the civilized world for their skill, were very fanciful about the locality from which the herbs used by them were collected. The kind of herb might be the same, but when gathered on a particular mountain or in a particular forest it was thought to have additional virtue. Drugs of the same name were classified as first, second, third or fourth quality, according to the source from which they came, and were priced and trusted accordingly. Hellebore was of two kinds, distinguished as black and white. The best black came from Mount Helicon, and the best white from Mount Œta. The town most famous for its preparation was called Anticyra, but this name was ambiguous.

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* From the *Gardeners' Chronicle*, January 2.

There is a well-known passage in "The Art of Poetry," written by the Roman poet Horace, in which he says, that to gain a reputation as a poet, a man must be so mad that three Anticyras cannot cure him, and must never have his hair cut. Multiplying by three was a common superlative figure of speech in Latin, as in any other languages, and perhaps Horace meant no more than this; but, on the other hand, he may have known that there were in Greece three towns named Anticyra, and possibly they were all places where the drug hellebore was prepared. One Anticyra was on a narrow strip of the land of the Locrians, between Ætolia and the sea. Strabo, an ancient writer on geography, and Livy, a Roman historian, both mention it. It was taken by the Romans in the second Punic war, and given over to their allies, the Ætolians. We know nothing of it as connected with hellebore, though Pliny tells us that Ætolian hellebore, which was of bad quality, was used to adulterate the better Parnassian kind. There was another Anticyra in the south-eastern corner of Thessaly, three or four miles from the sea, near the base of Mount Œta and the famous pass of Thermopylæ, but we do not hear of this town as producing hellebore, except on the slight authority of the lexicographer, Stephanus of Byzantium, who lived in the sixth century of our era. The third Anticyra, the only one which we know to have been famous in classical times for the manufacture of this drug, was situated on the southern coast of Phocis, not far from the base of Mount Parnassus, and within a few miles of Mount Helicon. The position of it is well known, and it is now named Aspra Spitia; it was not an island, as Pliny and others have wrongly said, and never can have been so in historic times; but it stood on a peninsula and had a good harbour. In Horace's day it was a place of resort for insane or epileptic patients, who went there to take a course of hellebore under resident physicians. Hence, to say, "You should go to Anticyra," was a polite way of telling a man he was a fool. Amongst others who had gone through this medical course there, Pliny mentions the philosopher Carneades, who went there for intellectual training, before publicly declaiming against the dogmas of the Stoics, apparently supposing that a medicine which could make madmen sane would make sane men still wiser. Also Drusus, a famous popular leader of the Romans, was cured there of epilepsy. The same writer adds that this drug, which retained its virtue for thirty years, and once was thought so formidable, had now become so "promiscuous" in its use that students often took a dose of it to sharpen their intellect when they were puzzled by difficult passages in their reading—a valuable hint, by the way, for candidates before a competitive examination! I recollect a virtuous freshman at Cambridge, who, with a similar object, laid in a large stock of "Reading biscuits," which he saw advertised in a window!

The next question is, what were the kinds of hellebore called black and white, and found respectively on Mount Helicon and Mount Œta? We ought to be able to answer this, because Edmond Boissier has told us, in the preface to *Flora Orientalis*, that, thanks to the labours of the botanists, Orphanides and Heldreich, the flora of Greece is now better known than that of any other country within the scope of his work. The hellebore which is found to prevail on Mount Helicon, Mount Parnassus, and the neighbouring country is one to which E. Boissier gives the name of *H. cyclophyllus*. It is intermediate between *H. viridis* and *H. orientalis*, having been confused with the latter both by Sibthorp and by Heldreich. Perhaps it is not in cultivation in England, but it is described as being taller and having larger flowers and broader segments to the leaves than the green hellebore, which in other characters it resembles.

As for the white hellebore, it is evident from the vague descriptions of Theophrastus and Pliny, that neither of them knew a living hellebore by sight, but Pliny says that he had been told that the leaf of the black hellebore was of the shape of a plane leaf, but divided into several segments, and that the white hellebore had leaves resembling those of the beet, and deeply channelled at the back. He attributes to it a bulbous root like that of an onion, with fibrous tunics. Ancient and modern botanists have generally identified this with *Veratrum album*, which is figured in Gerard's "Herbal" as the white hellebore; but perhaps the best evidence is that of Heldreich, who explored Mount Œta in 1879, and found *V. album* growing there in abundance, confirming his previous opinion that this was the white hellebore of Theophrastus. The different effects of the two kinds of hellebore taken medicinally, as recorded by ancient authorities, correspond with modern experience; the black is a powerful cathartic, and the white a strong emetic. This is a summary of all that is known or likely ever to be known of the famous hellebores of the ancients. (*C. Wolley-Dod, Pharm. Journ.*, Jan. 30, 1892.)

We have never met with any kind of hellebore root in the Indian Bazars, nor are any of the genus known to grow in India; still, all Indian Mahometan works on Materia Medica contain an account of the hellebores of the Greeks, which has been copied from the writings of the Arabian physicians, and which is mostly a reproduction of what Dioscorides says *περὶ ἐλλεβόρου λευκου* and *περὶ ἐλλεβόρου μέλαηος* the *Verarum album et nigrum* of the Romans. The Arabs call these drugs *Kharbak-abiad* and *Kharbak aswad*, and in Indian medical works *Kutki* or *Kutaki* is given the vernacular equivalent of Kharbak, and this drug is sold as a substitute for it. For an account of Kutaki, see Vol. III., p. 10.

MAGNOLIACEÆ.

Constituents of Star-anise.

The determinations of volatile oil, fixed oil, and ash gave the following percentage figures:—

	Volatile Oil.	Fixed Oil.	Ash.
Carpels	6·11 5·20	1·13 1·47	2·81
Seeds	3·00 2·40	22·9 21·7	2·46

The volatile oil consists chiefly of anethol $C^6H^4(OCH^3)C^3H^5$; with small quantities of terpenes, safrol $C^6H^3(O^2CH^2)C^3H^5$, the monoethyl ether of hydroquinone $C^6H^4(OH)OC^2H^5$, anisic acid $C^6H^3(OCH^3)COOH$, and a complex aromatic substance yielding upon oxidation veratric acid and piperonal. The fixed oil contains the usual constituents along with cholesterin and derivatives of phosphoric acid. In the aqueous extract is found protocatechuic acid and shikiminic acid $C^7H^{10}O^5$, which by nascent hydrogen iodide is converted into benzoic acid. Sugar was not found in any appreciable quantity, the sweet taste of the fruit, therefore, depending upon the volatile oil. Nitrogenous bases could not be detected. (*F. Ostwald, Arch. der Pharm.*, 1891, 84—115.)

Michelia Champaca.

Merck describes a kind of camphor, called champacol, obtained from champaca wood by distillation with water. After purification it melts at 86—88°C., has the form of long white felted needles, has no odour when pure, but when kept in an impure state becomes liquid and develops the agreeable odour of the wood. (*Berichte*, 1892, p. 18.)

MENISPERMACEÆ.

Constituents of Calumba Root.

M. Bocchiola (*Chemist and Druggist*, Jan. 10, 1891) gives the following percentage composition of the cortical and woody portions of the root:—

	Outer part.	Inner part.
Water	13·00	14·00
Ash	5·00	6·00
Ether extract	0·70	0·80
Alcohol extract	3·89	3·86
Proof Spirit extract	17·96	17·80
Calumbine	1·42	1·90
Do. by titration	0·98	1·38
Berberine	1·43	0·72
Do. by titration	2·95	1·45

The percentage composition of the ash was:—

Silicic acid 14·13 and 7·42, phosphoric acid, as an iron salt, 6·11 and 1·61, phosphoric acid, combined with alkali and earthy bases, 5·04 and 12·63, in the outer and inner parts of the root.

The author found old roots to contain as much as 2·07 and 2·63 per cent. of calumbine, and 2·05 and 1·02 per cent. of berberine, showing their superiority over the younger roots.

BERBERIDEÆ.

Berberis vulgaris, *Linn.*

Aitchison (*Notes on Prod. of W. Afghanistan and N.-E. Persia*, p. 25) has the following notice of this plant:—"The Barberry, *jir*, *jir-khár*, *zer-khár*, *zir*, *zir-bár*, *zir-balak*; the fruit, *zirishk*, *sirishk*. A very common shrub, growing at an altitude of 2,000 feet and upwards, from which is largely collected the fruit; this is consumed locally, as well as being exported in some quantity to India, where it is highly appreciated by the natives as a condiment. Usually the fruit contains no seeds; it is then much more oval, longer, and of a much lighter colour than that which has seeds. On reaching the Punjab the fruit or preserve is called *zirishk-tursh*, to distinguish it in the trade from small, dried, black grapes; the latter are our European currants, or corinths. From the root-stocks of the

BERBERIS is obtained an extract called *Ibrán*; this is a yellow dye, which is also employed in medicine as a local application to inflamed eyes."

Podophyllum emodi.

We have met with the root in the plains in the possession of a pilgrim from Kedernath. He called it *Mámirán*, and greatly valued it as a remedy for ophthalmia, his small stock of four or five roots was carefully wrapped in several covers of silk.

Analysis of the Resin of Podophyllum emodi.

Ash	None.
Moisture	4·2
Oily and waxy matter, soluble in benzin	4·0
Podophyllotoxic acid	13·1
Podophyllotoxin, active principle	56·55
Inert matter insoluble in chloroform and soluble in alcohol	22·15
	100·0

The percentage of active principle, podophyllotoxin, in this sample is fully 25 per cent. higher than the average amount found in resin of podophyllum, which varies from 40 to 45 per cent. American podophyllum yields, on a large manufacturing scale, 5 per cent. of podophyllin, and accepting 10 per cent. as a practical average from the Indian, we should have a drug worth 2½ times in value. (*By F. A. Thompson, Ph. G., Am. Journ. Pharm.*, May, 1890.)

Podophyllotoxin.

This substance, which was first shown to be the active principle of Podophyllin by Podwissotzki, has now been obtained in a pure state by Neuberger (*Arch. f. exp. Path. u. Pharm.*, xxviii., H. 1, 1890); it forms colourless prismatic crystals, little soluble in water, but freely soluble in alcohol, forming an intensely bitter solution. Frogs were not easily affected by it, and it required a dose of 0·01 gram administered in mucilage to produce a muscular rigidity which was followed by death in three days; a congested state of the intestinal vessels was observed in some cases. It appeared to have little or no action upon rabbits. Cats were very susceptible to the poison, death following three days after the subcutaneous injection of 0·001 gram. In these animals, 2 to 3 hours after the injection violent and repeated vomitings occurred, at first of food, and afterwards of mucus tinged with bile, and containing some intestinal worms; there was also obstinate diarrhœa. Finally the animals became dull, the temperature fell, the limbs were paralysed, and death occurred from exhaustion. Dogs, pigeons, and fowls were similarly affected.

The *post-mortem* appearances observed were intense irritation, and sometimes abscess at the seat of the injection, the stomach normal or slightly injected, the upper portion of the mucous membrane of the duodenum highly injected, especially round the opening of biliary duct, the lower portion covered by a mass of brown epithelium mixed with detritus and mucus; the lower part of the small intestine, and the whole of the large intestine, was covered by hæmorrhagic patches, and here and there by a membranous exudation, with intense inflammation of the adenoid tissue, the sub-mucous and muscular layers not being affected. Liver congested, gall-bladder swollen and full of bile. Kidneys congested, with marked glomerulo-nephritis and commencing tubular nephritis. The distended gall-bladder and injection of the duct appearing to indicate elimination of the drug through the liver, the author tied the latter in three of the dogs experimented upon, and afterwards injected podophyllotoxin beneath the skin; the results were exactly the same as in the case of the dogs not previously so treated.

Injections of podophyllotoxin into the veins gave exactly the same results as when it was administered internally or injected subcutaneously. The circulation, respiration, and nervous system were only affected a little before the fatal termination in all the animals experimented upon.

From these experiments the author concludes that the drug acts as a simple irritant, and that its purgative action when given internally is due to irritation of the intestinal canal. When injected under the skin or into a vein, it is eliminated by the blood through the kidneys and intestine, and in its passage through these organs it sets up the irritative action already described.

Mr. J. C. Umney contributed a paper on *Podophyllum emodi* at the Pharmaceutical Conference held in Edinburgh in August 1892, from which we extract the following :—

The results of Podwissotzki's work on the resin of *P. peltatum* may be briefly summarized thus—

The physiologically active portion of podophyllum resin consists of podophyllotoxin, which is composed of picropodophyllin held in solution by picropodophyllic acid.

Picropodophyllin is a neutral crystalline principle, which, though the sole active ingredient of the resin, is inactive in its free state, owing to its insolubility, but in combination with, or more probably solution in, picropodophyllic acid is extremely active. The resin also contains an inactive acid—podophyllic acid, a yellow colouring matter,—podophylloquercetin and fatty matter.

The results of the examination of *P. emodi* resin are classified in the following table, and are compared with the analysis, under the same conditions, of a sample of resin of *P. peltatum* :—

	P. emodi.	*P. peltatum.*
Resin by official process for podophyllin resin	11·4	5·9
Constituents of the resin—		
Podophyllotoxin (crude)	17·8	33·8
Pure crystalline picropodophyllin	2·6	4·5
Picropodophyllic acid	not determined.	not determined.
Podophyllic acid	30·8	6·9
Podophylloquercetin	1·3	2·4
Fatty matter	2·3	5·7

The picropodophyllin melted at 208—210°C.
The podophyllic acid melted at 125°.
The podophylloquercetin melted at 248°.

Mr. Umney concludes his paper by saying that the rhizome of *Podophyllum emodi* yields nearly double the amount of resin yielded by *P. peltatum*, but the resin contained only about half the quantity of crystalline picropodophyllin, to which the value as a cathartic is due.

We have not heard of any medical opinions concerning the value of the resin, and without such opinion founded on physiological experiments we cannot decide the question of making this drug an official source of podophyllin resin.

PAPAVERACEÆ.

The Opium Assay Question.

Perhaps no chapter of Pharmaceutical Chemistry has received more attention and been more discussed than that of opium and its analysis. Scarcely a journal appears nowadays that does not contain an article or two upon how opium can "best" be assayed and just how the method of Prof. X—— or Mr. Y—— is inaccurate and unreliable. There is a certain sameness about articles written about opium assaying—a sameness that becomes monotonous in course of time, and causes the reader to become perplexed, if not disgusted, as the result of a perusal of them. Invariably the author picks all other methods to pieces and then proposes an "original new" method which gives better agreeing results, and is much more easily manipulated than any yet proposed. As a matter of fact, we possess not a single accurate and exact method of analysis of any plant or of any of its organic constituents. Plant analysis, as Dragendorff aptly remarks, has not yet reached the stage which enables us to say, without an interrogation point at the end of our sentence, that this plant contains just so much of that constituent and no more. Plant analysis is as yet synonymous with approximate analysis, and until our knowledge of the chemistry and physiology of plant life and growth has advanced considerably beyond its present status, it is doomed to continue to be approximate analysis. Hence, no method is accurate, as, for instance, is the determination of sulphuric acid as barium sulphate, or of hydrochloric acid as chloride of silver, and if one of them does give better agreeing results, and such as are nearer the mean of those obtained by all other methods, this is due most probably to the fact that in this particular method the sources of error are more nearly counterbalanced than in the others. It was, hence, from a purely impartial and critical standpoint that I undertook to compare several of the most prominent methods for assaying opium.

Those decided upon were the methods of Flückiger, Squibb, and of the U. S. Pharmacopœia—being virtually the ammonia *versus* the lime method. The drugs examined were Smyrna opiums from the house of Merck and of Gehe & Co., the former having been ordered and received by myself while still at the laboratory of Gehe. Rath Fresenius at Wiesbaden during the past summer, and the latter kindly given me by my instructor, Professor Flückiger, here at the laboratory. Both samples were finely powdered and dried at 80° C. for five hours. All three methods were begun at the same time, and the directions for each closely followed throughout. In both cases the determination by the U. S. P. method was completed long ere the others were, while Squibb's method, due to its more frequent washing and slower filtering, took up the most time. Just at this point I should like to protest against the impracticability and uselessness of weighing liquids, which so often is found in methods of plant analysis and nowhere else. As I see the matter, there is not one point in its favor, unless, perhaps, that it is an inherited custom, while there are certainly many points against it. Firstly—it occupies more time; secondly—accurate balances are not arranged for weighing liquids, and inaccurate balances (or moderately accurate balances, as their owners would probably prefer to term them) certainly make the weighing less accurate than measuring; and thirdly—weighing, even on accurate balances, is seldom, if ever, more accurate than measuring with graduated glassware, which every druggist does, or, at any rate, should possess. The U. S. P. method, besides being the shorter, required less attention and care than the other methods, and, as the figures will shew, gave the most satisfactory results. As this is all that is required of a method of analysis, I can see no reason why the present officinal process should be altered, for no other now in use is more exact and at the same time as practical. The morphine obtained in every experiment with the U. S. P. method was undoubtedly the whitest and purest of all the crystals obtained by any method. There was less washing necessary than in either Squibb's or Flückiger's method, and at the same time the filters and crystals upon them were beyond any question of a doubt the purest and whitest. Here follow the figures :—

	Merck Opium.	Gehe Opium.
Flückiger	9·52 p. c.	13·95 p. c.
Squibb	11·67 p. c.	16·52 p. c.
U. S. P.	11·44 p. c.	15·00 p. c.

As these figures shew, Flückiger's method gave the lowest and Squibb's the highest results, which facts are, however, very easily explained, and as follows: In Flückiger's method the result depends very much, if not entirely, upon the amount of shaking that is done, as Dieterich has conclusively shewn, and as I only shook for about half an hour steadily, with continued shaking at intervals of ten minutes for two hours more, it is very probable that all of the morphine did not separate out. The high figures obtained by Squibb's method are undoubtedly to be explained by the impurity of the resulting products, which fact could readily be detected by the naked eye, as they were invariably very dark-coloured. Despite all the washing that they were subjected to, they never once were even approximately near being colourless, and besides invariably dissolved in lime water only in part and gave as a result a very dark-coloured solution. It was found that continued washing would not remove the impurities, for long before the crystals and filter paper shewed any signs of becoming decolourized, the wash water ran through absolutely pure and colourless. In both cases the morphine obtained by the U. S. P. method dissolved completely in lime water and gave a pure, limpid, clear solution, while that obtained by Flückiger's method, although it gave a colourless solution in lime water, yet left a small residue amounting to several milligrams and consisting of narcotine, as did the residue obtained in Squibb's method. This would indicate that in the presence of alcohol and water, the ether does not completely dissolve all of the narcotine.

Morphine Picrate.

Inasmuch as this salt of morphine had not yet been described, and the similar salt of strychnine is practically insoluble in water, and hence enable us to determine the alkaloid as strychnine picrate, it was made by treating a solution of morphine hydrochlorate with a slight excess of picric acid, in the hope that it, too, might prove to be insoluble, and thus facilitate somewhat the method of determining morphine. Recrystallized from alcohol it crystallizes in groups of fine yellow needles arranged most peculiarly in the shape of warts, which grow one along-side of the other, and hang from the surface of the liquid looking much like plaits of hair. The salt melts, or, better, decomposes, without detonation at 157° C. It differs from the corresponding salt of strychnine, however, in not being insoluble in either water or alcohol, as determinations of its solubility gave the following results:—

In distilled water at 13° *C.*—15·6975 grams of a saturated solution yielded 0·031 grams of morphine picrate (dried at 100°) which gives a solubility of 1 part in 500 parts of water.

In absolute alcohol at 13° *C.*—7·2422 grams of a saturated solution yielded 0·009 grams of morphine picrate (dried at 100°) which gives a solubility of 1 part in 800 parts of alcohol.

This being the case, it is, of course, impossible to make use of the salt as a means of determining morphine. (*Alfred Dohme, Ph.D., Laboratory of Prof. Flückiger, University of Strassburg*, February 17, 1891; *Am. Jour. Pharm.*, April, 1891.)

The Chemistry of Opium.

At the instigation of my esteemed instructor, Prof. Flückiger, I undertook to study the phenomena which present themselves when opium is dialyzed. When the investigation was first begun, the prime object in view was to determine, if possible, to what cause the acid reaction of aqueous extract of opium was due, and how morphine was combined in the drug. As the work progressed, it was decided to study the relative quantities of the chief constituents of the drug, and, if possible, then draw conclusions in regard to how these are combined in nature in the same. In how far this has proven successful the conclusions will shew; suffice it to say here that the work was a very long-drawn out and laborious one, and not one of the results obtained with the ease which one is accustomed to in inorganic analysis. As is the case in every operation with drugs and plants of any kind, the numerous colouring matters, gums, resins, and the many other amorphous substances of which we have but little definite knowledge, save that they exist to worry the chemist, very much hindered the work in many respects. Dialysis was chosen, inasmuch as by means of it it was hoped that all of the looked-for constituents would pass into solution, while little or none of the undesired would follow suit. Besides this, no operation was to be performed with the opium which might change the nature of combination of its various constituents. It had been observed by Flückiger that there is, in all probability, enough sulphuric acid present in opium to combine with nearly all of the alkaloids present. Whether or not, however, it is sulpuric acid or meconic acid that is in excess and hence free, as yet remained an open question. It is certainly very probable that if it were a question of which acid would first and most readily be neutralized by the bases, that sulphuric acid would be the one, although mass action might cause some of the meconic acid to be in combination at the expense of sulphuric acid. With this aim in view, 50 grams of finely powdered opium were rubbed together with distilled water and the paste washed completely into a dialyser consisting of an oval gutta-percha ring covered with heavy parchment paper and immersed in a dish containing about five litres of distilled water. This was allowed to stand covered thus for nearly three months, the water being changed about twice a week. Even at the expiration of this time, sulphuric acid and alkaloids could be detected in the dialysate, and as my time here was limited, and the semester was rapidly drawing to a close, it was decided to finish the operation more expeditiously by exhausting the opium remaining in the dialyser with cold water. This last extract was treated separately, although exactly in the same way as the greater portion. While this operation was quietly progressing, a complete analysis of the ash of opium (the same as was used for dialysis) was made in order thus to get a definite idea of the mineral constituents of the drug. Accordingly, 20 grams of finely powdered opium were carefully and gradually ignited in portions in a platinum dish. It was found very difficult to completely incinerate the drug, so that even after heating the dish to a bright red heat the resulting ash was quite dark, in fact nearly black. It was found very advantageous at this point to treat the mass with a little cold water and evaporate this off on a water-bath, and finally, again carefully heat and glow it over a free flame. By repeating this operation several times, an ash was obtained, which was very nearly pure white in colour. When weighed, it yielded 3·89 per cent. of the original substance.

A complete analysis, the details of which it would be useless to enumerate here, gave the following results, these being expressed in per cent. of the ash weighed:—

	Per cent.
SiO^2	11·14
P^2O^5	8·07
SO^3	28·39
Fe^2O^3	1·98
CaO	9·04
MgO	8·31
K^2O	30·19
CO^2,HCl and undetermined constituents	2·88
	100·00

The dialysate was next evaporated down in portions to about two litres upon a water-bath, and the resulting deposit, consisting of colouring and other organic matter, as well as some calcium meconate, removed by filtration. The filtrate reacted acid to litmus, and in it were detected morphine, narcotine, narceine, codeine, sulphuric, and meconic acids. It was next acidified with hydrochloric acid, and after heating on the water-bath was treated with a boiling solution of barium chloride in excess. After standing over night the resulting barium sulphate was filtered off and washed out with hot water containing hydrochloric acid until it was white. It was then dried, ignited, and weighed, and yielded, with the portion that was similarly treated separately, the following figures:—

Portion I—$BaSO_4$	2·9236 grams.
Portion II— ,,	0·3920 ,,
Total...	= 3·3156

Equivalent to { 1·3945 grams H_2SO_4,
or 1·1384 ,, SO_3 }

The filtrate from this precipitate was neutralized and precipitated in the cold with ammonia which was added in slight excess. After standing for several days, the precipitated alkaloids were filtered off and the filtrate again made ammoniacal and left to stand, when more alkaloid was precipitated. This was continued until the resulting filtrate no longer gave a reaction for alkaloids. The various precipitates were then filtered off and dried at 80° C. to constant weight, and regarded as the total alkaloids of the opium taken. They were then treated for several days with an excess of lime-water until this took up no more alkaloid. The remaining alkaloids were then filtered off, washed with slightly ammoniacal cold water, and dried at 80° C. They were then weighed and regarded as narcotine. The results obtained are given below—

Porcelain dish + alkaloids (total)	= 24·3023 gr.
,, ,, alone	= 14·0465 gr.
Hence, total alkaloids found	= 10·2558 gr.
Narcotine (weighed on tared filter)	= 4·3631

giving as the final result—

Morphine, 5·8927 grams, equivalent to 11·79 per cent.
Narcotine, 4·3631 ,, ,, to 8·73 ,, ,,

The other alkaloids present in opium, such as codeine, narceine, papaverine, &c., were not considered separately, as they, in all probability, play the same *rôle* with respect to the acids present as does morphine.

In a separate experiment with the same opium, which was dialysed in the same manner as that just described, the dialysate was shaken with amyl alcohol, the latter then separated and shaken in a separating funnel with a solution of sodium hydroxide for half an hour, and the alkaline layer separated as before. This was then acidified, and a few drops of it, when brought in contact with a drop of a solution of ferric chloride, gave a beautiful wine-red colour, thus shewing the presence of meconic acid. Inasmuch as experiments with morphine and narcotine meconates had shewn that neither of these are taken up by amyl alcohol, it follows that the free acid in the dialysate was meconic acid.

Conclusions.

(i) That the free acid in aqueous opium extracts is meconic acid;

(ii) That the silica in opium is present in the form of sand, and that the lime is most likely combined with phosphoric acid, while the magnesia and potash are probably combined with organic acids and some sulphuric acid;

(iii) That there is more than enough sulphuric acid present in opium to combine with all of the alkaloids present save narcotine; for the 5·8927 grams of morphine, narceine, codeine, &c., found, require only 1·0133 grams of sulphuric acid to form the salts $(C^{17}H^{19}NO^{3})^{2}\ H^{2}SO^{4}$, &c., whereas there were found in all 1·3945 grams of sulphuric acid; and

(iv) That hence, morphine, narceine, codeine, &c., are contained in opium combined with sulphuric acid as sulphates, while narcotine, at best only a feeble base, is combined in part, at least, with meconic acid, of which there is also some present uncombined in the drug.

In conclusion, I should like to take this occasion to thank Prof. Flückiger for the kind assistance and advice I obtained from him while working in his laboratory, and also Mr. J. E. Gerock, his excellent and kind assistant. (*A. Dohme, Am. Jour. Pharm.*, April, 1891.)

Protopine.

The name of *protopine* was given to a particular alkaloid first isolated from opium in 1870 by Hesse. It is only present to a small amount in the dried milky juice of the *Papaver somniferum.* Since its discovery by Hesse, it has been met with again by Eykmann in the *Macleya cordata*, and by Selle in the juice of the

Chelidonium majus: all of these plants belong to the same family of *Papaveraceæ*. In connection with this subject we read in a recent number of the *Therapeutic Gazette* that Dr. Engel has lately made some experiments on cold-blooded animals (frogs) and warm-blooded animals (guinea-pigs, cats, and rabbits), with the view of determining the physiological properties of this new base protopine. The results obtained may be briefly summarised as follows:—(1) In small doses protopine exercises on the frog narcotic effects similar to those produced by other opium alkaloids. (2) In large doses it produces a paralysing action on the muscular substance, and on the terminal ramifications of the peripheral nerves. (3) With small or moderate doses reflex action is not abolished, although this occurs when larger doses are given. (4) Protopine produces toxic effects in mammals, and these effects are comparable to those produced by camphor, death resulting from the paralysis of the respiratory centre. This last conclusion is very interesting. It is singular that camphor, which has not the chemical constitution of the alkaloids, and belongs to an entirely different group of bodies, should have been found to produce the same toxic effects as are obtained with new base protopine. The knowledge of this fact will cause camphor to be prescribed with more care than formerly, and it will probably lead to more useful applications of it, and to its employment in a number of cases for which it is not yet used. Protopine has not yet been introduced into therapeutics, and from the above experiments it is evident we must know more about it before it can find its place in pharmacy.

Tritopine—a new Opium Base.

M. Kander (*Archiv.*, ccxxviii., p. 419) reports the isolation of a new opium alkaloid, *Tritopine*, which occurs in smaller quantity than even protopine, and to which he assigns the formula $C^{42}H^{54}N^{2}O^{7}$. Like morphine and laudanine it is soluble in soda solution, but is reprecipitated in an oily condition by excess of the reagent. Its melting point, 182° C., is, however, 16° higher than that of laudanine, although the resemblance is again apparent in its behaviour towards sulphuric acid. Tritopine crystallizes without water of crystallization in characteristic transparent needle-like plates, and appears to be a di-acid base. (*Pharm. Journ.* [3], xxi., 247.)

Indian Opium.

In regard to opium, it has recently been suggested that India might be made the source of supply in place of Turkey. In a paper read at the Conference Meeting at Cardiff, Mr. E. M. Holmes expressed the opinion that there is no reason why India, instead of Turkey, should not supply the whole world with medicinal opium. This assumption appears to be rather premature and scarcely to be warranted by such knowledge as we possess of Indian opium. There seem to be several questions to be solved before the substitution of Indian for Turkey opium can be looked upon as feasible.

In the first place, it is necessary to ascertain whether opium can be produced in India of a quality equal to that of Turkey opium. Dr. Warden's statement that native opium is used for medicinal purposes in India does not sufficiently settle that point, but as he has sent over a sample of the Patna opium issued by the Medical Store Department of Bengal for medicinal use, we have examined it with a view to ascertaining the amount of morphine it contains and its applicability for pharmaceutical purposes.

The sample sent by Dr. Warden was in the state of powder, and as received it contained 3·2 per cent. of moisture. In the dried opium the amount of morphine was found to be 8·55 per cent.

A tincture was made with the dried opium, according to the directions of the British Pharmacopœia, and on examination it was found to yield on evaporation to dryness a residue of extract amounting to 21·3 grains per fluid ounce. The amount of morphine contained in the tincture was 2·74 grains per fluid ounce.

For the sake of comparison, another tincture was prepared with a good sample of Turkey opium that was found to contain, in the dry state, 10·84 per cent. of morphine. The extract yielded by this tincture on evaporation amounted to 19·8 grains per fluid ounce. The amount of morphine in it was 3·4 grains per fluid ounce.

It may be pointed out that in both the abovementioned instances the extraction of morphine from the opium in making the tinctures by the method of the British Pharmacopœia was practically complete, as will be seen from the following comparison of the quantities of morphine actually found by experiment:—

	Found. Grs. per fld. oz.	Calculated. Grs. per fld. oz.
Indian opium tincture	2·74	2·80
Turkey " "	3·40	3·55

Both these tinctures were of the ordinary character, and there was scarcely any perceptible difference in their appearance. (Dr. B. H. Paul and A. J. Cownley in *Pharm. Journ.*, December 24th, 1892, p. 505.) For further information on the employment of Indian opium for medicinal purposes, the reader is referred to some correspondence in the *Pharm. Journ.* for 1892 by Messrs. Holmes and Warden.

FUMARIACEÆ.

Fumarine.

According to Herr Reichwald (*Pharm. Zeit. f. Russl.*, March and April, 1889), fumarine has a composition represented by the formula $C^{21}H^{19}NO^{4}$, and can be obtained in colourless crystals, freely soluble in chloroform, less soluble in benzol, still less soluble in alcohol and ether, and sparingly soluble in water. When placed upon the tongue, fumarine is tasteless, but a solution in acidulated water has a bitter taste. It is inactive towards polarized light. On the other hand, crystalline corydaline, prepared from *Corydalis cava*, has a composition represented by the formula $C^{20}H^{19}NO^{2}$. Among other points of difference between the two alkaloids, fumarine is described as giving with concentrated sulphuric acid immediately an intense violet colour, whilst corydaline remains colourless for several hours, and then only becomes pale violet. Corydaline treated with strong nitric acid takes at once an intense golden-yellow colour, whilst fumarine is only faintly yellow, becoming darker after a time. The yield of fumarine was only equal to 0·04 per cent. of the dried herb used. (*Pharm. Journ.*, June 8th, 1889.)

Fumaria parviflora, *Lamk.*

Under the name of *Shahtereh*, we have received this plant from Afghanistan.

CRUCIFERÆ.

Aitchison (*Notes on Prod. of W. Afghanistan and N.-E. Persia*, p. 194) records the collection of the seeds of *Sisymbrium Sophia*, Linn., for medicinal use under the name of *Khakshi* or *Khakshir*.

Lepidium sativum.

Mohideen Sheriff has used these seeds with success in dysentery and dysenteric diarrhœa. The seeds are small, red or reddish-brown; elliptical, oval or oblong; about one line in length and half of that in thickness; taste mucilaginous and slightly pungent when chewed and swallowed, and their smell is slight, peculiar, and not unpleasant. When immersed in water, the seeds become coated with mucilage.

CAPPARIDEÆ.

Mærua arenaria, *H. f. and T.*

Fig.—*Roxb. Flor. Ind. ii.*, 570.

Hab.—Central and Southern India. The root.

Vernacular.—Poomichacarei (*Tam.*), Puta-tiga (*Tel.*).

History, Uses, &c.—The earth-sugar root of the Tamils has been used in Hindu medicine in Southern India for many years. In the *Pedatasintharmine*, the author says of it: "It cures skin eruptions, all venereal affections, fever, piles, and strengthens the human system." Dr. Ainslie, in his *Materia Indica*, ii., page 330, says: "This root in external appearance is not unlike liquorice root; it also somewhat resembles it in taste, but is not nearly so sweet; it is prescribed, in decoction, as an alterative and diet drink." The drug is used by Mahomedans and Hindus as a sexual stimulant and tonic, antisyphilitic, and alterative. It can be used either in a fresh or dried state. The outer brown covering is supposed to be harmful, and is removed previous to use. Dr. P. S. Mootoosawmy, of Tanjore, has used the root in his medical practice, and on his forwarding a flowering and fruiting specimen of the plant to Mr. Lawson, of the Madras Botanical Department, it was identified as *Mærua arenaria*. Roxburgh describes the plant under the name of *Capparis heteroclita*, R., and remarks that the unripe fruits are boiled and eaten by the natives.

Description.—*Mærua arenaria* is a large, unarmed, climbing shrub; leaves elliptic; corymbs terminal; calyx four-cleft; corolla regular, four-petalled; stamina on the receptacle, which is as long as the tube of the calyx. The most remarkable part of the plant is the fruit; this is a beaked berry, two to five inches long, deeply constricted between the seeds, fleshy, elongate, moniliform, one or more seeded. There is only one seed in each single berry or lobe of the compound fruit.

The roots are plump when fresh, from 1 to 1½ inches in diameter, long, cylindrical, contorted, with a light brown surface. When dried they become darker in colour and wrinkled longitudinally, and several irregularly-disposed transverse markings of a lighter colour are observed on the surface. The transverse section of the root exhibits a central hard woody centre of a yellowish colour, and several similar but smaller bundles are scattered throughout the waxy-looking parenchyma of the cortical portion. In the bazars the drug is sold in the shape of circular discs like calumba root, having been sliced transversely in a fresh state and allowed to dry in the sun. Sections of the root examined by the microscope exhibited no starch or crystalline matters in the cells, but yellow granular matter and oil globules were present. The central woody column and woody bundles in the cortical portion were made up of large lignified cells. The taste is sweet and mawkish, and there is no distinctive odour as there is in liquorice root.

Chemical composition.—The finely powdered root lost 11·26 per cent. of moisture, and left 6·6 per cent. of mineral matter when ignited. The ether extract amounted to 4·22 per cent., and consisted of fatty acids of a brownish colour and fluid consistence. After standing a few days, white crystals formed, which were collected and pressed between folds of blotting paper, and recrystallised from boiling alcohol. This insoluble portion had the melting point (62° C. and properties of palmitic acid. Oleic acid was present in the fluid portion of the extract.

The alcoholic extract contained a large quantity of crystalline saccharine matter, which reduced Fehling's solution to a very slight extent. A small quantity of an organic acid was removed from solu tion by plumbic acetate, but no substance similar to glycyrrhizin could be detected. The absence of an alkaloidal principle was proved after the application of the usual reagents.

The aqueous extract contained an additional quantity of sugar, and when heated to the boiling point threw out an abundance of white flocks of albumin. A larger quantity of the root was exhausted directly with water, the extract heated to separate the insoluble albumin, and filtered. The syrup was then boiled in an inverted condenser with 1 per cent. sulphuric acid for three hours. The sulphuric acid was removed with barium hydrate solution, and the sugar in the syrup estimated with Fehling's test indicated the presence of 41·2 per cent. of invert sugar. This sugar showed no disposition to crystallise, and when examined in a Laurent's polariscope, it had no action on polarised light.

CARYOPHYLLEÆ.

False Bikh or Bikhma.

Towards the end of 1891 certain medico-legal exhibits were received in the Chemical Examiner's Department, Calcutta, from the Mongyr District, including a parcel of roots labelled *Bikhma.* Bickhma or Bishma, we may mention, is the vernacular name for *Aconitum palmatum.* Specimens were sent for identification to the Calcutta Bazaars, and recognized as Bikhma; we also forwarded some to Nepal, where it was recognized, and stated to be sold as Bikhma in the Bazaars. Up to this period we had had no opportunity of examining authentic specimens of Bikhma, and being doubtful whether the drug we had received from Mongyr was true Bikhma or not, we forwarded a sample to Dr. Dymock, Bombay, who reported as follows:—"They appear to be the rhizomes of an aroid, and are not unlike those of the genera Lagenandra, Arum, and Cryptocoryne. They have been cured by some smoking process, have a strong tarry odour, and are somewhat translucent, tough, and flexible. They have no resemblance in structure to any kind of aconite. I have never seen them before." Dr. D. Prain, of the Royal Botanic Gardens, Seebpore, to whom we also submitted a specimen, wrote: "I cannot identify it for certain, but it is, I think, a leguminous rhizome. It might be a glycyrrhiza." Subsequently Dr. Dymock kindly sent us a specimen of true *A. palmatum*: "some of the same batch I sent to Flückiger, and which was examined by Shimoyama. I kept it as being a remarkably fine sample; as the drug is expensive, it may be adulterated with aconite. Rs. 6 per lb. is the price, and aconite is only 9 annas." His sample, when compared with ours, was wholly dissimilar. Under the circumstances we thought it might be of interest to examine the spurious Bikhma, and our results are embodied in this note. In the condition in which the roots were received they were so horny that it was impossible to powder them, and they were cut into fragments, exposed to a temperature of about 80° C. for some time, allowed to cool, and then at once pulverised. During the process the dust caused watering of the eyes and sneezing. When dried at 100° C. the powder lost 6·23 per cent. of moisture. In extracting the powder 315·5 grammes were exhausted with boiling rectified spirit, and the tincture evaporated on a water-bath until it ceased to smell of alcohol. The resulting extract was of a dark brown colour and of the consistence of treacle. The marc left after extraction with boiling spirit was repercolated with 250 c.c. cold spirit containing 1 per cent. of tartaric acid, and the spirit evaporated off at a low temperature. The two extracts were now mixed with water containing 2·5 grammes of tartaric acid, and the mixture agitated with light petroleum ether. During agitation a few yellowish flocks separated. The petroleum ether extract amounted to 1·173 per cent., calculated on the root containing 6·23 per cent. of moisture. The petroleum ether extract was yellowish-brown in colour, semi solid in consistence, and waxy in odour. The taste was nauseous, recalling croton oil. In absolute alcohol it was wholly soluble with strongly acid reaction. On spontaneous evaporation of the alcoholic solution, a yellow transparent mass was left at the bottom of the beaker, while on the sides the deposit was yellowish-white and opaque. On microscopic examination, it appeared as minute needle-shaped crystals. An attempt was made to separate the petroleum ether extract into fractions, and with this object it was gently warmed with proof spirit, which dissolved a certain amount, and the extract was thus roughly divided into a soluble and insoluble residue. The proof spirit solution, on spontaneous evaporation, deposited soft orange resinous matter, while some white deposit separated on the sides of the capsule. This was found to consist of oil globules, and a few minute needle-shaped crystals. In addition to oil and resinous matter possessing an acid reaction, the presence was also detected of an alkaloidal principle soluble in ether, which afforded marked indications with the usual reagents. With Fröhde's reagent no change was observed in the cold, but a dirty blue developed on gently warming. The portion of the petroleum ether extract insoluble in proof spirit was boiled with alcoholic potash, the solution evaporated to dryness and treated with water. The aqueous solution was turbid from the separation of brown flocks. The turbid solution was agitated with petroleum ether. The ethereal extract had a camphoraceous and terebinthinate odour, was of an orange colour, and had a melting point of 62° C. It was not further examined. The aqueous soap solution was decomposed by dilute sulphuric acid and agitated with ether. The ether extract was converted into a lead soap and reagitated with ether. The soluble lead soap, after separation of lead, afforded a residue which was liquid at ordinary temperatures and of a reddish-brown colour. When agitated with a freshly prepared solution of nitrate of mercury, it solidified to a yellowish mass. The insoluble lead soap, after separation of lead, afforded a residue which was solid at ordinary temperatures, and had a melting point of 48°. Neither of these fatty extracts was pure, and no attempt was made to ascertain whether they consisted of single acids or mixtures. The presence of glycerine was determined in the original aqueous sulphuric acid solution. The aqueous acid solution of the alcoholic extract of the roots, after treatment with petroleum ether, was agitated with ether. The ethereal solution was allowed to evaporate spontaneously, and the final desiccation conducted over sulphuric acid. The non-crystalline residue was dark brown and tacky with tar-like odour; it amounted to ·123 per cent., calculated on the roots containing 6·23 per cent. of moisture. Warmed with distilled water, a part of the extract dissolved, the solution affording the following reaction:—

Reaction, strongly acid.
Fe^2Cl^6 gave a dirty greenish coloration, passing rapidly to dirty brownish.
$AgNO^3$, slight turbidity; on warming Ag. reduced.
Aqueous NH^3, orange yellow coloration.
Acetate of lead, dirty yellowish, white ppt.
Gelatine, no precipitate.
KCN., no reaction.

That portion of the ether extract insoluble in warm water was treated with aqueous NaHO, and the dark brown solution which resulted agitated with ether. The ether solution exhibited slight fluorescence, and on spontaneous evaporation afforded a yellow crystalline deposit, which appeared as needles and rosettes on microscopic examination. By treating this residue with proof spirit a certain amount of neutral resinous matter of a yellow colour was separated. This was precipitated on dilution with water. The insoluble crystalline residue afforded no crystalline sublimate when heated between watch glasses. The aqueous soda solution of the ether extract was mixed with dilute sulphuric acid and reagitated with ether. The ethereal extract was of a yellowish-brown colour, strongly acid in reaction, and had the properties of an acid resin.

The tartaric acid solution of the alcoholic extract of the drug was now mixed with a very slight excess of sodium bicarbonate and again agitated with ether. After agitation and on subsequent standing, a small quantity of a white crystalline substance separated, which floated on the water stratum below the ether. The ether was separated and allowed to evaporate spontaneously, the extract amounte to ·048 per cent.; it formed a yellow transparent varnish on the sides of the capsule, while at the bottom it was white, chalky, and indistinctly crystalline; odour, aromatic. The chalky deposit consisted of some irregularly-shaped plates and amorphous particles. The yellow varnish-like residue was easily soluble in proof spirit, but neither this portion nor the chalky deposit afforded any reaction with alkaloidal reagents. The chalky deposit treated with concentrated H^2SO^4 afforded a yellow solution in the cold, changing to pinkish on standing for some time, but on heating the pink colour was developed rapidly. Nitric acid, no reaction. Fröhde's reagent, greenish in the cold, passing to blue on warming. Ferric chloride, no reaction Heated with dilute aqueous H^2SO^4 and the solution neutralised it reduced an alkaline copper solution on boiling. When agitated with water, considerable frothing was noted. A small amount injected, mixed with water, into a cat's stomach induced no symptoms When applied to a cat's eye, there was no change in the size of the pupil observed. The yellow varnish-like deposit separated from the chalky deposit, by the action of proof spirit, when injected into a cat's stomach caused the animal to vomit once a small quantity of frothing liquid; one formed stool was also passed, but no other symptoms were noted. The varnish-like residue, when applied to the tip of the tongue, produced a slight sensation of tingling or numbness, which lasted for a short period, and could not be mistaken for the symptoms induced by aconitine.

The alkaline aqueous solution of the alcoholic extract was next agitated with chloroform. The extractive was yellowish-brown, with an odour like that of gum benzoin, and amounted to ·064 per cent. In *cold* proof spirit it was partly soluble, the solution on spontaneous evaporation affording a residue which contained a few microscopic plates. The residue insoluble in cold proof spirit was pale yellow and soluble in boiling proof spirit. On spontaneous evaporation a white crystalline deposit was obtained, consisting of bundles of rods and a few plates. The residue frothed when agitated with water, and when treated with concentrated sulphuric acid yielded a rose coloration. The alkaline aqueous solution of the alcoholic extract was finally agitated with amylic alcohol. The extract amounted to 1·582 per cent., and formed a transparent, soft, viscid residue of a reddish-yellow colour, non-crystalline, and frothing considerably with water. In warm water it dissolved, forming a clear solution, which became turbid on cooling. An attempt was made to decolourise the aqueous solution by agitation with purified animal charcoal, but very little colouring matter was thus removed. As neutral salts, as NaCl, $MgSO^4$, gave a white curdy precipitate from the aqueous solution of the extract, an attempt was made to separate the saponin-like principle by saturating the watery solution with $MgSO^4$; it was found, however, that the flocks agglutinated together, forming a sticky mass, and filtration was impossible. Baryta water was next used for separating the principle. With this object the amylic alcohol extract was dissolved in water and excess of aqueous barium hydrate added. The turbid mixture was then filtered (filtrate A), the precipitate was washed with baryta water and transferred to a beaker, water added, and CO^2 passed for a considerable time. The turbid mixture was then evaporated to dryness on a water-bath, and exhausted with rectified spirit, the filtered alcoholic solution was evaporated to dryness, and left a scaly, friable, shining residue, which afforded the following reactions:—With concentrated H^2SO^4 a yellow coloration, changing to red. Concentrated HNO^3, yellow. In concentrated HCl it dissolved freely, forming a faint pinkish coloured solution, the colour deepening on the application of heat, and a few flocks separating. In strong acetic acid it was also readily soluble, forming a colourless solution, no change being induced by the subsequent addition of potassic dichromate. When heated with aqueous phosphoric acid it did not yield a clear solution, no colour developed, and no odour. With aqueous ammonia it was sparingly soluble; no precipitate with acetic acid; the ammoniacal solution frothed on agitation. Boiled with dilute HCl, it afforded a solution which reduced alkaline copper. The amount of principle precipitated by baryta was small, and though this principle afforded some of the reactions of saponin, it seemed probable that the greater part was still present in the filtrate.

A fresh portion of the original amylic alcohol extract was dissolved in water, and treated with lead acetate, which afforded a white curdy precipitate, after separation of lead by H^2S, yielded extracts which frothed strongly on agitation with water, and gave some of the reactions of saponin. The amount of extractive yielded was, however, small, and it appeared to us that probably both the lead precipitates were either unstable compounds of a saponin with that metal, from which the greater part of the principle could be separated by washing, or that they consisted chiefly of easily soluble lead salts of a saponin, or of a lead salt of a saponin mechanically mixed with a saponin precipitated by the action of lead acetate, in the same manner as we have found certain neutral salts to act. But, on the other hand, it was possible, assuming the existence of more than one saponin-like principle in the plant, that one saponin formed a stable and insoluble lead compound, the other an unstable or soluble salt. And similar remarks might also apply to the barium hydrate precipitate.

As bearing on these points the following experiments were made:—The amylic alcohol extract was dissolved in water, excess of lead acetate added, and the turbid mixture repeatedly agitated with amylic alcohol. During agitation the greater part of the precipitate agglutinated, forming a yellow viscid coating on the bottom and sides of the bottle. This deposit appeared to be very slightly soluble in amylic alcohol. It was soluble in acetic acid, and the acid solution, when agitated with amylic alcohol, afforded an extract which frothed with water, and yielded certain of the reactions of saponin. The viscid deposit from which this extract was obtained would therefore appear to represent a saponin, which formed a stable lead compound, only slightly soluble in amylic alcohol. The original amylic alcohol solution was next examined to ascertain if it contained any saponin-like principle or not. It was first filtered, and then evaporated to dryness on the water-bath. The residue was yellowish and brittle, and contained a small quantity of lead. The amount of extract was far larger than that obtained from the viscid deposit after decomposition with acetic acid. Lead was removed by dissolving the extract in water and passing H^2S. The filtered solution was then evaporated to dryness, the residue reduced to fine powder and repeatedly agitated with ether, which removed some colouring matter and traces of amylic alcohol. The resulting powder was white and free from odour. It afforded the following reactions:—With cold water it formed a slightly opalescent solution, which frothed considerably on agitation. Concentrated H^2SO^4 at first faint yellow, changing to pink, carmine, with violet at the edges on standing, and green on the addition of potassic dichromate. Concentrated HNO^3 colourless, yellow on the addition of dichromate, and changing to blue on standing for some time. In concentrated acetic acid, readily soluble, forming a colourless solution. Soluble in dilute ammonia, forming a solution which frothed, and from which acetic acid gave a white precipitate on neutralisation. Caustic soda, similar reactions to ammonia. Tannic acid, a white precipitate. Ferric chloride, a turbidity in the cold, which disappeared on heating, the solution being of a brown colour. On boiling with dilute HCl, dark brown, oily globules separated, and the solution reduced alkaline copper. This decomposition product did not appear to possess the properties of the principle described as *sapogenin*, obtained by the action of dilute acids on ordinary saponin. The ash amounted to ·47 per cent.; it was free from lead.

To determine the ultimate composition of this saponin, it was dried over sulphuric acid in a vacuum, and the combustion made in an open tube in a current of oxygen, and the results afforded the following percentages :—

	Exp. 1.	Exp. 2.	Mean.
Carbon	60·92	61·18	61·05
Hydrogen ...	8·93	8·74	8·84
Oxygen... ...	30·15	30·08	30·11
	100·00	100·00	100·00

From these percentages a formula $C^{32}H^{54}O^{12}$ was deduced—

	Calculated for $C^{32}H^{54}O^{12}$.	Found.
Carbon	60·95	61·05
Hydrogen	8·57	8·84
Oxygen	30·48	30·11
	100·00	100·00

In another experiment a somewhat different mode of extracting the saponin was adopted. An alcoholic extract was obtained from another sample of *Bikhma*, no acid being used in the extraction. The alcoholic extract was mixed with water and directly extracted with amylic alcohol, without previous treatment with petroleum ether, ether, and chloroform. The amylic alcohol containing the crude saponin was separated, filtered, and then repeatedly agitated with aqueous basic lead acetate. During agitation the yellow viscid matter, already mentioned, separated on the sides of the bottle. The agitation with basic lead was continued for a considerable time, until colouring matter ceased to be dissolved. The amylic alcohol was then allowed to stand for some days, filtered, and evaporated on a water-bath. The extract was next taken up with water, and lead removed by H^2S. After filtration the solution was again evaporated to dryness, the extract reduced to powder, and repeatedly agitated and digested with ether. The saponin extracted in this manner had a faintly yellowish colour, and contained 6 per cent. of ash free from lead. After drying over sulphuric acid *in vacuo*, the following results were obtained on ultimate analysis:—

	Exp. 1.	Exp. 2.	Mean.
Carbon	60·12	60·21	60·165
Hydrogen	8·35	8·54	8·445
Oxygen	31·53	31·25	31·390
	100·00	100·00	100·000

Some of the saponin used for the last analysis was subjected to a further process of purification. It was dissolved in amylic alcohol, and the solution repeatedly agitated with aqueous barium hydrate. On evaporating the amylic alcohol solution to dryness, and heating the powdered extract with ether to separate traces of amylic alcohol, the saponin was left as a white powder which contained ·308 per cent. of ash. On ultimate analysis, the following percentages were obtained, the saponin being dried *in vacuo* over sulphuric acid:—

	Exp. 1.	Exp. 2.	Mean.
Carbon	59·90	59·82	59·86
Hydrogen... ...	8·64	8·62	8·63
Oxygen	31·46	31·56	31·51
	100·00	100·00	100·00

It seems likely to us that the last sample of saponin isolated was the purest of the three examined, though we are not prepared to definitely assert it was a *pure* saponin. We have adduced some evidence which tends to indicate that at least two saponins exist in false Bikhma, and it is possible that the method we used for separation afforded a mixture. It was our intention to have determined the ultimate composition of the saponin in combination with lead, to which we have referred as a "viscid yellow compound," and to have examined the product yielded by the hydrolysis of the saponin, but we were unable to complete our research.

The results of the proximate analysis of the false Bikhma may be stated thus :—

Moisture....	6·23
Petroleum ether extract...	1·173
Acid ether extract	·123
Alkaline ether extract ...	·048
Chloroform extract	·064
Amylic alcohol extract ...	1·58

We also append the results of an analysis of the specimen of *A. palmatum* referred to above. Our 100 parts afforded the following results when examined by Dragendorff's method :—

Petroleum ether extract...	·040
Ether extract	·048
Absolute alcohol extract...	·150
Water extract	2·40

An alcoholic extract affords the following percentages :—

Petroleum ether extract	·946
Acid ether extract	·310
Alkaline ether extract	·371
Amylic alcohol extract	·976

The compositions of these extracts we were also unable to examine.

We may summarise our results by stating that the most important constituents of false Bikhma are saponin, and as bearing on the identification of the plant which yields the drug, we would refer to Aitchison's "Notes on Products of Afghanistan and Persia," in which it is stated that the name *Bekh* is technically applied to the root-stocks of *Acanthophyllum macrodon* and *Gypsophila paniculata.* These are both used as soaps, and possibly false Bikhma may be derived from one of these plants. (*C. J. H. Warden and Assistant Surgeon Chuni Lal Bose in "Pharm. Journ.," October 15th,* 1892, *p.* 302.)

PORTULACEÆ.

Chemical Composition of Portulaca oleracea.

Water	92·61
Nitrogenous substances	2·24
Fat	0·40
Non-nitrogenous extractive	2·16
Cellulose	1·03
Ash	1·56
In dry substance—	
Nitrogen	4·85
Carbohydrates	29·23

(*König, Nahrungs Mittel*, p. 147.)

TAMARISCINEÆ.

Remarks on the substance called Gez or Manna found in Persia and Armenia.

At entertainments in Persia a sweetmeat called *Gezangabeen* is usually met with, the pleasant taste and other singular properties of which, as well as the mystery that involved its origin, excited my curiosity to know if it were an animal or a vegetable production.

The principal ingredient in its composition is a white gummy substance called *Gez*, which, when mixed up with rose-water, flour and pistachio nuts into flat round cakes that are generally made three inches in diameter and a quarter of an inch thick, has much the appearance and feel of common dough, though a little more hard. It is at the same time both adhesive and brittle, for any attempt to cut it shows the former quality, as it sticks to the knife; and if pulled, it admits of being drawn out to some length like birdlime. The mode, however, generally practised of breaking it for use is by placing one cake on the palm of the hand somewhat hollowed and striking it with the other, when the blow occasions it to fly into several pieces, whose edges, rather unexpectedly, appear smooth and polished like broken glass.

Collection.—Before daylight we marched from Khonsar, and, on clearing the boundaries of the town, deviated from the main road as we had been directed, and began rambling amongst the bushes on the face of the mountain on our right, diligently looking for the *gez*. The directions we had received were to examine the bushes closely, as the object of our search was not easily visible at any distance; too much confidence, however, in the knowledge of our servants and guide who, with true Persian effrontery, asserted they were familiar with the appearance of the *gez.* in its natural state, nearly occasioned us a complete disappointment. We had relinquished the pursuit in very ill-humour, to resume our journey, when we met, as chance would have it, two peasants proceeding to the spot we had just quitted: as usual, we accosted them, and were not a little pleased at hearing they were the people whose occupation it was to gather the *gez.* These men were furnished with a stick three-fourths of an inch in diameter and curved at the further extremity, which was covered with leather, and a kind of oval leathern bowl, near three feet long and two broad, with a handle to it, resembling an egg-shell cut in two longitudinally. Besides these, they had a sieve suspended from the right side, to free the *gez* from the insects and small pieces of leaf that generally fall with it when first beat from the bush: the bottom of the sieve was of coarse woollen cloth.

The countrymen were easily persuaded by a trifling present to fall immediately to work and show us a specimen of their employment. They turned off the road a few yards amongst the bushes we had just quitted, and placing the leathern receptacle underneath, they beat the bushes on the top with the crooked stick; in a few minutes they had obtained a handful of a white kind of sticky substance not unlike hoar frost, of a very rich sweet taste: this, after being purified by boiling, is mixed up into the sweetmeat before mentioned under the name of *gezangabeen.*

Though the *gez*, when fresh gathered from the *gavan* bush, admits of being sifted, still in this original state it is brittle and adhesive at the same time, qualities for which it is so remarkable after its preparation as a sweetmeat. If pressed, it sticks to the fingers; but on being smartly struck with a bit of wood separates easily into small grains like lump-sugar. It is in this state in cool weather, or when the thermometer does not exceed 68° F.; but liquefies on being exposed to a higher temperature, resembling white honey both in colour and taste.

The shrub on which the *gez* was found is called the *gavan;* it grows from a small root to the height of about two feet and a half, spreading into a circular form at the top from three to four feet and a half in circumference. Captain Stewart, the gentleman with whom I was travelling, remarked that it had a striking resemblance to the broom, but it did not, we were informed, bear a yellow flower. The leaves were small and narrow, and underneath we saw the *gez* spread all over the tender branches like white uneven threads, with innumerable little insects creeping slowly about.

These little creatures appeared to derive their subsistence from the leaves and young bark of the bush they inhabit; and this is the opinion of the country people. They are either three distinct species of insects, or one in three different stages of existence: one kind is perfectly red, and so diminutive as to be scarcely perceptible; the second, dark and very like a common louse, though not so large; and the third, exactly like a very small fly. They are extremely dull and sluggish, and are found lying or creeping about between the bark of the *gavan* and the *gez*. The peasants, as well as the inhabitants of Khonsar, were decidedly of opinion that this curious substance is the production of these minute animals, as neither the insect nor the *gez* are found on any other tree in the neighbourhood; nor can we be allowed to imagine it may be a vegetable gum, as no appearance of any gummy liquid oozing from fissures in the bark of the bush could be observed on the closest examination. The people who are engaged in the collection of this curious article continue their occupation every third day for twenty-eight days during September. A journey, which I subsequently made to Baghdad, convinced me that the *gez* is not exclusively confined to this district, but is found in the range of mountains running through Koordistan, dividing Persia from Asia Minor and Mesopotamia, where it is called manna by the Armenians, and said to be exported in quantities through Erzeroom to Constantinople. (*By Captain B. Frederick, from the* "*Transactions of the Literary Society of Bombay,*" *September* 28*th*, 1813.)

Note.—The *gavan* is *Tamarix gallica*, var. *mannifera*, Ehrenb., and the aphis, which feeds upon it and produces the *gez*, is the *Coccus manniparus* of Ehrenberg. The name Gezangabeen is loosely applied by the Persians to the true manna obtained from *Cotoneaster nummularia* in Korasan, the correct name of which is *Shirkhisht*.

TERNSTRŒMIACEÆ.

Camellia theifera, *Griff.*

Tea seeds contain 35 per cent. of a somewhat thinly fluid, tasteless, inodorous oil, of a straw to amber colour, which resembles olive oil. At 15° C. it has a sp. gr. of ·9270; at 38° C. it forms an emulsion and solidifies only below—5° C. It is scarcely soluble in spirit of wine, and very sparingly in ether. Chemically, it consists of 25 parts stearin and 75 parts of olein. In China it is used as a table and lamp oil and for the manufacture of soap, for which it is specially well adapted, yielding a beautiful hard soap.

Tea oil has been used in China for a very long time, but has been only recently introduced into commerce. *C. oleifera* and *C. drupifera* yield oil for household purposes similar to the above. (*Brannt.*)

Caffeine and Theine: their identity, and the reactions of Caffeine with Auric Chloride.

In consequence of the conclusions of Mays (*Journ. Physiol.*, 7, 458; *Therapeutic Gazette*, 1866, 587), and more recently of Lauder-Brunton and Cash (*Proc. Roy. Soc.*, 42, 283; *Journ. Physiol.*, 9, 112), that the physiological action of theine obtained from tea differs in certain respects from that of caffeine obtained from coffee, the authors have searched for evidence of isomerism in these bases, the existence of which is not put beyond doubt by the chemical comparison of them which has hitherto been made.

Having extracted theine from tea and caffeine from coffee, it is shown that the two substances exactly resemble each other, and melt at precisely the same temperature, *viz.*, 234°·5 (corr.). From each base the crystalline *aurochloride* ($C^8H^{10}N^4O^2$, HCl, $Au\,Cl^3 2\,H^2\cdot O$) was prepared, and these two salts both melted at 242°·5 (corr.). When dried at 100°, they both lost the equivalent of two molecular proportions of water, and the anhydrous salts melted at the same temperature, *viz.*, 248°·5 (corr.). The analytical data corresponded with the formulæ given above. The complete correspondence in the properties and composition of the aurochloride is satisfactory evidence of the absence of a structural difference in the bases. In order to further confirm the identity of the two substances, a specimen of each was converted into the mercuric chloride compound ($C^8H^{10}N^4O^2$, $HgCl^2$), a stable crystalline salt. Both preparations were found to melt at the same temperature, *viz.*, 246° (corr.), and to exactly correspond with each other in other respects.

The complete identity of caffeine and theine having thus been demonstrated, the observed differences in their physiological action must be ascribed either to impurities in the specimens used, or to variations in the animals employed in the experiments. The circumstance that theine was found to be more active than caffeine, and to be capable of producing effects not produced by caffeine, tends to support the view that the theine was impure. It is now well known that tea contains other bases than caffeine, the presence of traces of which might be sufficient to account for the observed differences.

During the preparation of the pure aurochlorides for a comparison of their properties the authors obtained two new and interesting auric derivatives of caffeine.

When an aqueous solution of caffeine aurochloride is heated, a yellow, flocculent precipitate is gradually formed, which is insoluble in alcohol, chloroform, and ether, but dissolves in hydrochloric acid, reproducing the aurochloride. The substance dried at 100° forms a pale yellow amorphous powder, which melts at 207° (corr.). Analysis proved it to be aurochlor caffeine $C^8H^9(AuCl^2)N^4O^2$, a substance in which one atom of hydrogen in caffeine is replaced by the group $(AuCl^2)$. It is pointed out that the ready formation of this remarkable compound from caffeine aurochloride by the loss of two molecular proportions of hydrochloric acid—$C^8H^{10}N^4O^2, HCl, AuCl^3 = 2 HCl + C^8H^9(AuCl^2)N^4O^2$—is better shown by Medicus's formula for caffeine, than by that proposed by Emil Fischer, since in Medicus's formula the CH group which loses hydrogen is represented as contiguous to the doubly-linked nitrogen atom, to which the auric-chloride is attached.

By the reaction of an alcoholic solution of potassium chloraurate $(KCl, AuCl^3)$ with a solution of caffeine in chloroform, a salt, crystallizing in the dark red needles, was obtained. This is shown to be caffeine potassium aurochloride $(C^8H^{10}N^4O^2, KCl, AuCl^3)$ which differs from caffeine aurochloride in containing potassium in the place of the hydrogen of hydrochloric acid. This salt melts at 208° (corr.). It readily dissolves in alcohol and water, forming yellow solutions which appear not to contain the salt itself, but its constituents, caffeine and potassium chloraurate. The salt is nearly insoluble in ether and chloroform, but prolonged contact with these liquids leads to its decomposition into caffeine and potassium choloraurate (*W. R. Dunstan and W. F. J. Shepheard, from the Research Laboratory of the Pharmaceutical Society—The substance of a communication made to the Chemical Society, December 15th,* 1892.)

MALVACEÆ.

Althæa lavateræflora, *DC.*

Aitchison (*Notes on Prod. of W. Afghanistan and N.-E. Persia*, p. 9) notices it as a cultivated plant usually grown on the ridges between fields. It is grown not only for the showiness of its flowers, but for the petals, which are collected as they fall off the plant, and employed in local medicine or exported under the names of *gul-i-khatmi* or *gul-khairu*. The seeds are also collected and sold as *tukm-i-khairu*, and the roots as *reshai-khatmi*. We have received the flowers from Afghanistan, where they are used as a substitute for those of *A. officinalis*; they are very mucilaginous.

STERCULIACEÆ.

Heritiera littoralis, *Dryand., Rheede, Hort. Mal. vi., t.* 21.

The seeds of this plant, common on the coast, have been substituted for white Kola nuts, to which, when the chestnut coloured, papery, episperm has been removed, they bear some resemblance, but are a little larger and nearly orbicular, with a somewhat sinuous instead of an angular outline. Heritiera seeds are from 0·010 m. to 0·015 m. thick, and have a diameter of about 0·04 m.; they are concave on one side and convex on the other, and are composed of two cotyledons, one of which is double the size of the other. Heckel and Schlagdenhauffen (*Nouv. Remèdes*, 1887, p. 155) give the following as the composition of the almond:—

Oil	4·366
Tannin and colouring matter	4·983
Sugar	5·738
Sodium chloride	0·288
Cellulose and starch	55·987
Albuminoids	13·537
Lignin	12·367
Fixed salts	2·645
Loss	0·089

The ash contained traces of iron and manganese, and consisted chiefly of phosphates and sulphates of lime, potash, and soda. No caffeine was found. The seeds are eaten in India, and it is evident from the analysis that they have considerable alimentary value.

Sterculia alata, *Roxb. Bedd. Fl. Sylv., t.* 230.

The kernels contain 45·27 per cent. of a bland oil possessing some siccative properties. Eighteen kernels were eaten by one of us without any symptoms being induced, hence Roxburgh's statement that the seeds under the name of *Toola* are said to be eaten by natives in Silhet as a cheap substitute for opium is probably based on incorrect information. The tree is one of the largest found in Bengal, and seeds very freely; in our opinion the kernels form a most excellent substitute for ordinary almonds, which they resemble in shape and size. Theobromine and caffeine were specially looked for with negative results.

Sterculia scaphigera, *Wall.*

These remarkable fruits are brought to India by Mahomedan merchants from Java and Singapore by way of Karaikal and Nagore, seaport towns on the Coromandel Coast. They are called Oomas-Mungoo in the Malay language, and are used as a demulcent drink.

Sterculia Gum.

Mr. J. H. Maiden, in an article on Sterculia gum (*Pharm. Journ.* [3], xx., 381), shows in the following table how suitable it is as a substitute for Tragacanth :—

	Sterculia.	Tragacanth.
In cold water ...	*a.* Colourless .. *b.* Granular jelly ... *c.* Adhesiveness absent or very small.	*a.* Opalescent. *b.* Smooth viscid mass. *c.* Adhesive.
Boiling in dilute alkali.	Insoluble	Almost entirely dissolves.
Caustic soda and warming.	No change of colour.	Canary-yellow colour, which fades on cooling.
Boiling in dilute acid.	Soluble, forming arabin (*J. H. M.*).	Soluble, forming pectin (*Giraud*).
Alcohol added to quid formed in (10).	Whitish precipitate (*see* fuller statement).	Formation of floating glairy mass.

He found Sterculia gum to yield to cold water only 3·14 per cent., consisting chiefly of Arabin; 75·1 per cent. of the gum was found to be Pararabin. The gum contained 16·6 per cent. water, and yielded 5·83 per cent. ash.

Mr. Maiden draws attention to the fact that Pararabin is the chief constituent of the vegetable jellies known as Agar-agar, a Ceylon moss, both of which are used by the natives of India as an article of diet like Sterculia gum, and are supposed to be very strengthening.

A sample of gum said to be from *Cochlospermum gossypium* was found by him to be similar to that of Sterculia, but as it had pieces of lace bark attached to it, it was probably Sterculia gum.

LINEÆ.

Linamarin.

A. Jorissen and E. Hairs (*Acad. roy. de Belgique* (3) 21 (1891), 529) have isolated a glucoside, linamarin, from the germs of *Linum usitatissimum.* The germs, coarsely powdered, were treated repeatedly with boiling 94 per cent. alcohol, the latter recovered and the residue taken up with warm water. The resin and fat are separated, and the aqueous solution treated with a slight excess of lead acetate. After filtration and precipitating the lead with H^2S the liquid is evaporated to a syrupy consistency. This residue is extracted with boiling alcohol, the solvent recovered for the greatest part, and the remaining liquid mixed with ten times its volume of ether under constant agitation. The residue remaining on distilling off the ether is taken up with water and this solution concentrated. Standing over sulphuric acid for some time, the concentrated solution is converted into a crystalline mass of linamarin. For purification it is again treated with ether and alcohol as above. Lastly, the principle is dissolved in two parts of warm absolute alcohol, and the solution cooled under agitation. The germs yield about 1·5 per cent. of the glucoside, which forms colourless needles possessing a refreshing but very bitter taste, is soluble in water and alcohol, but almost insoluble in ether. Concentrated sulphuric acid does not colour it; dilute mineral acids decompose the glucoside into hydrocyanic acid, a fermentable sugar reducing Fehling's test, and a volatile compound possessing some characters of ketones, and giving with iodine and potassium hydrate the iodoform reaction. Boiling barium hydrate liberates ammonia. Linamarin contains C 47·88 per cent., H 6·68 per cent., N 5·55 per cent., O 39·89 per cent. (*Am. Journ. Pharm.*, Dec. 1891.)

Growth of the Indian Linseed Trade.

Dr. G. Watt (*Dict. Econ. Prod. India*, Vol. V., p. 76) shows that the trade has expanded from about 3 cwts. in 1832 to 8,461,374 cwts. in 1888-89.

Erythroxylon Coca grown in India.*

Several samples of *Erythroxylon Coca* leaves, grown in various districts in India, have been examined by Warden; the mode of culture, altitude, and meteorological characters of the district, the kind of soil and manuring, and the methods of curing being taken into consideration. The alkaloid was estimated by Squibb's modified method: the dry pulverized leaves were moistened with alcohol acidified with sulphuric acid, percolated with alcohol, the percolate mixed with acidified water, and extracted with ether, then rendered alkaline with sodium carbonate, and again extracted with ether. This extract was washed twice with water, dried and weighed; the amounts of "crude alkaloid" so determined are given in the following table:—

District where grown.	Moisture.	Per cent. dry leaves.	
		Ash.	Crude aklaloid.
Ranchi, young leaves	6·18	6·71	1·139
" mature leaves	8·22	8·99	0·883
Arcuttipore, Cachar	6·08	7·39	1·369
" "	6·72	6·36	1·671
Darjeeling	10·37	7·58	1·115
Alipore, Calcutta	10·42	10·23	0·358
Matelli	9·30	12·18	1·022
Chulsa, Dooars	5·71	7·62	0·610
Jaunpore	10·05	12·64	0·571

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* *Chem. News*, lviii., 249-251, 260-262, 273-276: *Journ., Chem. Soc.*, March, 1889.

The crude alkaloid was very faintly yellow, and in no case showed any tendency to crystallization, although attempts were made to induce crystallization by extracting at various temperatures, and without applying heat, and by employing different acids and solvents. The allakoid obtained is, nevertheless, quite similar to cocaine from other sources in its physiological action, except that it seems to be more active. It dissolves readily in hydrochloric acid, and yields a soluble and insoluble platinochloride, the former containing 18·75, the latter 18·88 per cent. of platinum; discrepancies from the theoretical are assumed to be due to a variable quantity of cocamine (*Hesse, Am. Journ. Pharm.*, 1887, p. 455) in the alkaloid from Indian leaves. Both platinum salts yielded bases producing marked anæsthetic effects on the tongue; Howard has observed that the insoluble platinochloride obtained from other leaves was devoid of this property (*Pharm. Journ. and Trans.*, July 23, 1887). In one instance, stellate crystals of the base from the soluble platinum salt were obtained. Applying Williams' method, the crude alkaloid showed 2·89 per cent. of impurity, but the precipitates were not crystalline. It is noted that after the addition of ether to the acidified alcoholic solution, larger deposits of the sulphur-yellow cocatannic acid were obtained from those samples containing the highest percentages of alkaloids; it is hence suggested that possibly cocaine exists in the leaves as cocatannate.

Methods of cultivating the plants are described: the leaves are first gathered 1½ years after transplanting, subsequently whenever they are sufficiently mature; and, although the method of curing does not appear to affect the quality or quantity of the alkaloid obtained, nevertheless it is best, taking into consideration Paul's experience, to dry them, soon after gathering, at as low a temperature as possible, and when dry and cold to pack them closely in air-tight chests, as they are very hygroscopic. The quantity of alkaloid produced increases with the age of the plants (which attain a height of from 2 to 6 feet) up to 10 years, and after 20 years a slight falling off is observed, although they are in their prime even when 35 or 40 years old.

From the above results, obtained from plants and leaves of various ages, it would seem that, in India, neither altitude nor rainfall have much influence on the proportion of alkaloid in the leaves. The ash, in all cases except one, was white, the exception being an ash of a reddish hue from mature Ranchi leaves. A partial examination of some of the ash showed that they contained the following percentages :—

Samples from	Soluble constituents.	K cal. as KHO.
Darjeeling	44·42	29·26
Alipore, Calcutta	34·60	19·13
Arcuttipore, Cachar	59·02	29·84
Matelli	64·17	31·36

So that both nitrogenous and potash manures will probably be required in the future to keep up the yield from the same plantation.

Fruit of Erythroxylon Coca.

The fresh ripe fruit weighed, on an average, ·158 gram each ; they were bright scarlet in colour, and possessed a distinctly sweetish taste, but though masticated at various times, no physiolgical action on the mucous membrane of the mouth was observed. Dried in vacuo over sulphuric acid, the original tint was only slightly deepened, and this method of desiccation was employed in preparing the fruit for analysis.

Microscopically described, the fruit from without inwards presents first a single row of brick-shaped cells forming the epidermis ; within them is a single row of very large cells containing a mass of starch granules and scarlet colouring matter. Next comes the pulp, composed of parenchymatous cells, containing starch and granular matter. Then the shell, composed of an outer layer of stony cells, like bone cells, which are of considerable length ; within this layer is a row of scalariform vessels, and then several rows of pitted vessels. Then the almond, the cells of which are full of starch.

The petroleum ether extract was a deep reddish semi-solid residue, which, on microscopic examination, was found to contain lamellæ and needles of a claret colour. It contained no alkaloid, and melted at 34—35° C. A portion was saponified with alcoholic potash, and when cold agitated with ether. At 189—191° this extract melted to a clear yellow liquid, which cooled to a brittle transparent mass. Heated between watch-glasses for several days, a white sublimate was obtained, but the amount was far too small to admit of a melting point determination, or the application of other tests, in order to establish the identity of this compound with phytosterin or analogous cholesterin-like principles. The fatty acids melted at 53—54°.

The powdered fruits were then exhausted with ether, which dissolved out an alkaloid, having a slight numbing sensation on the tongue, and appearing to be cocaine.

Absolute alcohol then removed cocatannic acid and an alkaloid; and finally water extracted colouring and albuminous matters, and something which reduced alkaline copper solution on boiling.

The percentage composition of the fruit as deduced from the examination may be arranged as follows:—

Moisture lost at 100° C. after partial desiccation over sulphuric acid...	5·423
Ash	4·271
Petroleum ether extract containing 3·021 per cent. of glycerides of fatty acids, and 1·519 per cent. of impure phytosterin (?) with colouring matter...	4·540
Ether extract, soluble in petroleum ether ·232 per cent., soluble in water and containing cocaine ·11 per cent., soluble in absolute alcohol ·069 per cent., soluble in ether but insoluble in petroleum ether, alcohol or water ·029 per cent.	·440
Absolute alcohol extract containing cocatannic acid and a trace of alkaloid	3·820
Aqueous extract ...	23·440

(*C. J. H. Warden, Pharm. Journ.*, July 5th, 1890.)

RUTACEÆ.

Oil of Lemon.

V. Olivieri (*Gazz. Chim.*, xvi., 318) found in oil of lemon, besides the limonene (Wallach), also another terpene $C^{10}H^{13}$, boiling at 170—170·5° C. (338—339° F.), the tetrabromide of which fuses at 31° C. (88°F.), but the dihydro-chloride showing the characteristics of limonene. From the higher boiling portions the author has furthermore isolated a sesquiterpene $C^{15}H^{24}$, boiling at 240—242° C. (464—468° F.), which increases in quantity with the age of the oil. For detecting adulteration with turpentine, the author recommends the use of the polarimeter. Lemon oil is lævogyre

$(\alpha)_D = -55°$, while oils of turpentine are more or less dextrogyre. (French oil of turpentine is lævogyre.) (*Am. Journ. Pharm.*, Dec. 1891.

Neroli oil.

In order to be able to submit neroli oil to a closer examination, Messrs. Schimmel obtained in the spring of last year, from the Riviera, a large quantity of the flowers of the bitter orange. The blossoms were consigned preserved in diluted sea-water, and were received in good condition with the full odour of fresh flowers. From the equivalent of 560 kilos of fresh flowers, there was obtained by a process of cohobation 0·460 gram of pure neroli oil, which in many respects differed from the best French distillates met with in commerce. It had a specific gravity of 0·887, and was optically inactive. Already at a temperature of + 11° C., it showed an abundant separation of a solid body in fine shining scales. At 0° the oil solidified to a mass of the consistence of butter. The stearoptene of neroli oil, like the stearoptene of rose oil, appears to be a paraffin-like body; it can be separated from the liquid portion of the oil by the addition of 90 per cent. alcohol, in which it is difficultly soluble. The specific gravity of eleven samples of commercial neroli oil obtained from the best sources varied between 0·875 and 0·886 at 15° C. Of nine oils, one was optically active, whilst the others were all dextrorotatory, the rotation varying between + 0°52′ and + 9°40′. Only one solidified at 0° C., the others remained liquid and did not show any separation of stearoptene upon the addition of 90 per cent. alcohol. The cause of these differences between Messrs. Schimmel's distillate and commercial samples is not explicable without further investigation.

Ægle Marmelos.

The extract from the flower, called in English Marmel water, and known in Sinhalese as "Pinidiya," is used by the natives as scent one festive occasions. It is also sometimes added in the preparation of, sweetmeats for flavouring them. During the flowering season, boys and men in the villages surrounding Colombo may be seen plucking the flowers and bringing them in baskets to the town for sale, wher they are readily bought for distillation. An infusion of the flower is also used as a cooling drink. (*H. D. Lewis in "Trop. Agric.,"* Sept. 1889, p. 218.)

SIMARUBEÆ.

Quassine.

Oliveri and Denaro give the following mode of preparation of quassine (*Gaz. Chim. Ital.*, No. XIV.): Infuse for six hours 10 kilograms of powdered quassia with 45 liters of boiling water, taking care to retain the heat. Decant the liquid and make a second infusion. Unite the liquors and evaporate to 10 liters, filter and precipitate with q. s. of tannin. Place this impure tannate of quassine upon a filter, wash carefully, dilute with water, treat with carbonate of lead, and dry in a water-bath. Treat the tannate of lead and quassine two or three times with boiling alcohol, and distil the united liquors. The residue deposits crystals of quassine mixed with resinous matter. Purify by repeated crystallizations in alcohol and water. Thirty kilograms of quassia give 10 grams of pure crystallized quassine. Evaporations should be made slowly and alkaline reactions should be avoided.

BURSERACEÆ.

Chemistry of Myrrh.

Dr. Oscar Köhler publishes the results of a chemical examination of Myrrh from Sumali (*Archiv.*, June 2, 1891, p. 291): Ash 2·79 per cent., portion soluble in water 57 to 59 per cent., consisting of a gum, $C^6H^{10}O^5$. The portion soluble in alcohol was a mixture of resins. The greater portion was an indifferent soft resin (C) soluble in ether, $C^{26}H^{32}O^9$. Two bibasic acid resins, one (A) $C^{13}H^{16}O^8$, and the other (B) $C^{26}H^{32}O^9$. The essential oil 7 to 8 per cent.; the principal constituent corresponds to the formula $C^{10}H^{14}O$. If the formula for A resin be doubled, all three formulæ will contain 26 atoms of carbon, and the resins differ in the amount of oxygen they contain—

Indifferent resin C = $C^{26}H^{31}O^2\,(OH)^3$.
Resin acid B = $C^{26}H^{32}O^9$.
Resin acid A = $C^{26}H^{32}O^{16}$.

MELIACEÆ.

Naregamiaalata.

Naregamia has been physiologically investigated by Dr. Stefan Schœngut of Vienna. He used it in 24 cases, namely, one of dysentery one of pleurisy, two of pneumonia, four of emphysema, five of bronchitis, five of heart failure, and seven of tuberculosis of the lungs in different stages. One to three grammes of the tincture were given daily in doses of 3/10 to 6/10 of a gramme. Dr. Schœngut found the tincture to act as an emetic in doses of 1 to 2 grammes. No styptic or other action on the digestive organs was observed, and no benefit was derived from it in the case of dysentery. He says: "Further experiments in this direction were suspended, and the application of the remedy was confined to diseases of the air passages. In such cases Naregamia has proved to be an excellent expectorant, and especially in cases where, with a limited amount of secretion in the bronchi, a disposition existed to extreme coughing, but where there was the presence of a tough and tenacious sputum which embarrassed the elimination of this undesirable factor. In one case of bronchial catarrh, which from time to time betrayed asthmatic symptoms, Naregamia rendered great service. In a number of cases of heart difficulty, comprising two of fatty degeneration of the heart in which catarrh of the air passages existed, Naregamia proved itself very serviceable. In the case of one patient with fatty heart, after several days' use of Naregamia the objective symptoms of catarrh disappeared, the rasping diminished materially, and although the quantity of the sputum at first increased, it finally almost ceased.

Dr. Schœngut also states that the tincture of Naregamia has a decidedly beneficial action in cases of pulmonary emphysema, and that it seemed to aid the expectoration in pneumonia during the period of resolution where the râles were prominent and frequent. In the case of patients affected with dyspnœa, he found that the breathing became less difficult under its influence, but the effects seemed to be due to an increased freedom of expectoration and the consequent removal of accumulated secretions from the lungs, an opinion which agrees with the results of experiments on animals by Prof. von Basch, showing that it has no direct action on the respiratory centres.

No special influence on the circulation has been observed under the influence of Naregamia, only a short and irregular increase of pressure being noted after large doses reaching up to 5 grammes.

Naregamia does not exert any perceptible effect upon the digestive organs, and no toxic properties reside in the remedy.

SAPINDACEÆ.

Sapindus Honey.

(*Letter to the Honorary Secretary, Bombay Natural History Society.*)

I am sending you a box of dead bees I picked up under a tree now in flower in the gardens, *Sapindus emarginatus.* The tree begins to flower about the middle of October, and bears a profusion of small, whitish, inodorous blossoms which attract the bees. It seems very strange that insects possessing such a wonderful instinct should drink the nectar from the flower and get killed in this way, for I found them dead in thousands under the tree. The effect produced appears to be that of a powerful purgative, and there are now numbers of bees buzzing about on the ground unable to fly. (*Thos. H. Storey, Oodeypore, December*, 1890.)

The bees sent were *Apis indica.* It appears from this letter that the nectar in the flowers of the Soap-nut tree contains *saponin*, the active principle of the plant. The fact here recorded has not escaped the attention of the Hindus, as Sanskrit writers mention a plant or flower growing in Malwa which they call Bhramara-mari, Bhringamari, or Bhramarari, *i.e.*, "bee-killing."

Schleichera trijuga, *Willd.*

The seed-oil of this tree, which is known in the Sunda Islands under the name "Macassar oil," and enjoys a great reputation as a hair dressing and means of removing scurf and eczema, has been submitted to examination by Messrs. Thümmel and Kwasnic (*Pharm. Zeit.*, May 20, p. 314). It was found that the seeds, which contained no starch grains, yielded to petroleum ether 68 per cent. of fixed oil, but from the seeds freed from epidermis only 45·8 per cent. was obtained by pressure. The oil was in both cases of the consistence of butter, yellow, mild in taste, and with an odour of bitter almonds. It melted at 21° to 22° C., but after long standing the more solid glycerides separated, melting first at 28° and appearing under the microscope as fine needles. The fatty acids, with the exception of 3·14 per cent. of free oleic acid, were present as glycerides. Of those in combination 70 per cent. consisted of oleic acid, and of the solid fatty acids 5 per cent. was palmitic acid and 25 per cent. arachic acid, the characteristic acid of the groundnut. Lauric acid was not present, and of the volatile fat acids only acetic acid and no butyric acid could be detected. Hydrocyanic acid was found in the oil and in the seeds, being determined as 0·03 per cent. in the former and 0·62 per cent. in the latter. No amygdalin could be detected in the seeds, but hydrocyanic acid, benzaldehyde and grape sugar, possibly the decomposition products of it, were found. A small quantity of cane-sugar was also separated in the crystallized form (*Pharm. Journ.*, May 30th, 1891).

Saponin.

The varying statements made by different authors in respect to saponin have induced Dr. Hesse to attempt to ascertain whether the substances described in recent years under that name are identical; and, if so, by what empirical formula saponin would be best represented (*Annalen*, cclxi., 371). The first question he answers in th affirmative, having arrived at the conclusion that pure saponin from quillaia bark is identical with that obtained from various caryophyllaceous plants, and with senegin. As to the second, Dr. Hesse favours the formula $C^{32}H^{52}O^{17}$, assuming the correctness of the formula attributed by Rochleder to sapogenol, the decomposition product, together with three molecules of glucose, of saponin, and that the reaction goes on in the normal way, one molecule of water being taken up for each molecule of glucose split off. The successive decompositions effected by acids may then be represented as follows:—

$$2\,\underset{\text{Saponin.}}{C^{32}H^{52}O^{17}} + 6\,H^2O = 2\,\underset{\text{Sapogenol.}}{C^{14}H^{22}O^2} + 6\,C^6H^{12}O^6.$$

$$2\,C^{32}H^{52}O^{17} + 5\,H^2O = \underset{\text{Sapogenin.}}{C^{34}H^{54}O^9} + 5\,C^6H^{12}O^6.$$

$$2\,C^{32}H^{52}O^{17} + 5\,H^2O = \underset{\text{Saponetin.}}{C^{40}H^{66}O^{15}} + 4\,C^6H^{12}O^6.$$

$$2\,C^{32}H^{52}O^{17} + 4\,H^2O = 2\,\underset{\text{Saporetin.}}{C^{20}H^{32}O^7} + 4\,C^6H^{12}O^6.$$

(*Pharm. Journ.*, May 2nd, 1891.)

R. Kobert considers that there are a series of saponins of the general formula $C^nH^{2n-8}O^{10}$, several of which are known. Saponins of the same formula and of the same chemical properties appear to have different physiological characteristics, and show great differences in their poisonous action. The sapotoxin of the *Agrostemma Githargo* (corn cockle), one of these substances, is absorbed both by subcutaneous tissues and by the intestinal canal, and thus acts as a dangerous poison. It is recommended that, before using this seed as food, the shell and embryo should be separated. (*Chem. Centr.*, 1891, ii., 176.)

ANACARDIACEÆ.

Mango Kernels.

Hindu doctors consider the kernels of the unripe Mango fruit to be very astringent, much more so than the kernels of the ripe fruits. Mohideen Sheriff and P. S. Mootoosawmy speak highly of the powdered kernels as a remedy for diarrhœa in place of chalk powder. In times of scarcity the boiled seeds have been used by the natives as a food. An analysis is here given of the kernels of unripe and ripe Mango fruits:—

	Unripe.	Ripe.
Fat...	14·28	14·75
Tannin	8·97	8·45
Sugar and Gum	4·90	6·00
Ash	1·98	2·32
Moisture	11·22	11·28
Residue	58·65	57·20
	100·00	100·00

The residue consisted mostly of starch. The fat, after washing with alcohol, melted at 34° and became solid again at 30°. (*D.H.*)

Anacardic Acid as Hair Dye.

The pigmentary properties of the viscous liquid secreted under the pericarp of the cashew-nut (*Anacardium occidentale*) has long been known, and the liquid has been stated to yield a good indelible stamping ink. According to Herr Gawalowski (*Zeit. öst Apot.-Ver.*, Sept. 10, p. 485), the ammonium salt of anacardic acid ($C^{22}H^{32}O^{31}$), one of the constituents of the liquid, can be advantageously used as a means of darkening the hair. For this purpose the hair is first moistened with an aqueous solution of the salt and afterwards combed with a comb that has been dipped in a solution of ferrous sulphate, or the ammonium anacardate may be applied in a pomade or oil, and instead of the solution of ferrous sulphate an oleate of iron may be employed. It is stated that after a short exposure to the air the hair so treated assumes a more or less dark colour, which is tolerably persistent, but nothing is said as to the exact tint. It is obvious that anacardic acid used for this purpose must be quite free from the acrid cardol that accompanies it in the nut. Herr Gawalowski directs that it should be prepared by treating the residue from the evaporation of an ethereal extract of the crushed pericarp with water as long as the washings showed traces of tannic acid, then dissolving it in 15 to 20 parts of alcohol, shaking the solution vigorously with freshly precipitated lead hydrate, filtering and washing the precipitate with alcohol and decomposing the lead salt so obtained with freshly prepared sulphide of ammonium and filtering. Upon strongly cooling the filtrate, which contains the ammonium salt of anacardic acid and excess of ammonium sulphide, and treating it with sulphuric acid, the acid separates at once as a soft mass, which after being pressed between filter paper is dissolved in ammonia and then remains soluble in water. According to Dymock (*Veg. Mat. Med. W. Ind.*, p. 199), a tar obtained in roasting the nuts, and largely used in India for tarring wood, contains about 90 per cent. of anacardic acid and 19 per cent. of cardol. (*Pharm. Journ.*, Oct. 3rd, 1891.)

LEGUMINOSÆ.

A description of the preparation of Catechu or Cutch.

The merchants of Nasik, Gangapur, and other towns engage the services of the *Kátoris** for the purpose of manufacturing Catechu. It is usual with these merchants to descend into the Concan at the termination of the rains. They enter into an arrangement with several of the chief Naiks to proceed with them for the purpose of preparing the required quantity of Catechu. As the Kátoris are generally in debt to the grain-dealers of the different villages, near which they reside, the traders adjust matters with the grain-dealers by paying part, and becoming responsible for the balance of the debt, on the return of the Kátori to his old residence. The trader being joined by the Kátoris, the latter select a spot where the Khair trees (*Acacia Catechu*) are numerous. The merchant then begins to erect an extensive shed, but as he has only one or two servants and three or four matchlock men with him, he employs the Kátoris to build it.

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* कातोडी or कातकरी the name of a jungle tribe in Western India, whose principal occupation is the collection of कात or Catechu.

These sheds often cover one or two begahs of ground. In the centre a temporary dwelling is built, in which the merchant resides and lodges his supply of stores for the consumption of the Kátoris and his own establishment. The following are generally the articles in store: Rice, *náchni*, *urid*, onions, garlic, pepper, salt, turmeric, cocoanuts, cumin, asafœtida, salt-fish, ghi, oil, tobacco, steel, arrack, and various sorts of coarse cloths. These things are disposed of to the Kátoris at from 50 to 75 per cent. above their value in the neighbouring markets.

The Kátoris erect their *bhoongas* or huts around the merchant's shed, and in front of their hut they prepare the *táṛoo* or fire-place. They form the fire-place by digging a trench four or five cubits in length and one in breadth, which they cover at the top and leave the ends open to admit the air to pass freely through. In the top there are twelve small round holes to receive an equal number of pots.

Before they commence the operation of cutting any billets of wood, they perform certain propitiatory rites, by worshipping one of the Khair trees. Having procured a cocoanut, some red pigment, and a little frankincense, they select a tree for their purpose, rub the red pigment on the trunk near the root, burn the frankincense in front of it, and then break the nut; after which they join their hands in a supplicatory position, and address themselves to the tree, asking it to bless their undertaking, and to allow them to prepare abundance of good catechu. Having constituted the tree by this ceremony, a subordinate deity, which they term *Rán Sheo Wária*, they divide the consecrated cocoanut among those present. Each family possessing a fire-place performs a similar ceremony. They make one or two incisions in the trunk of the tree during these rites, but will not cut it down at the time, although these trees are sometimes cut down at a subsequent period.

The following day the Kátoris proceed into the jungle and examine the Khair trees. They, in the first instance, strike two or three blows with an axe deep into the trunk of a tree to obtain a chip from near the centre, and if, upon examination, it appears to have attained maturity, that is, if it is of a red colour (termed by them márhi), and there appears a white crust formed by the inspissated juice, they are satisfied the tree is a valuable one and they cut it down. These people have a superstitious dread of bad luck attending their operations, and they object to a person speaking while a tree, which they are cutting, is in the act of falling. The branches, bark, and the white portion of the wood are cut away when the tree has been felled, and it is then taken home. The length varies from four to six feet, and as the wood is extremely hard, the cutting of one billet is considered sufficient labour for the day. The next day, early in the morning, they cut these billets into chips; however, they are careful not to cut more at one time than may be required for the boiling operations of the day, as they think the chips would be too dry on the second day. To enable them more conveniently to cut these hard billets into chips, they drive three pieces of timber, each having forked branches, of different lengths, firmly into the ground about half a pace distant from each other, and the lowest being on a level with the earth. The billet is placed in a sloping position in the forks, and lies quite secure to be cut. The chips are heaped near the fire-place, after which the men take their breakfast, and then proceed to the jungle. The labour attending the boiling process always devolves on the females: the Kátori's wife or wives (for they sometimes have two or three), when she has finished her own breakfast, kindles the fire in the *tároo*, and then puts two handfuls of chips, neither more nor less, into ten of the pots, leaving the one at each end empty; water is poured in until it rises four fingers' breadth above the chips; this is ascertained by means of a small stick marked like a scale, the lines being distant from each other a finger's breadth.

It has been mentioned that there are twelve holes in each fire-place to hold that number of pots, but should the persons composing the family be sickly or old, they will most likely only use six pots; each of these pots will contain about three quarts of liquid. The pots at each end are only used during the second and third stages of the process. When the liquid has been well boiled and evaporated to a finger's breadth under the surface of the chips, they take the pots successively off the fire, and pour the liquid into one of the empty ones; after it has been well boiled in this, they apply the scale, and, if it is ready, they transfer it to the other empty pot. It is boiled down in this pot till it has attained what they consider the requisite degree of consistency, and then emptied into a trough made of the Pangara tree (*Erythrina indica*), as the timber is soft and readily absorbs water. The women now fill the pots with fresh chips, and the boiling process is thus continued until evening.

Should the liquid in any of the pots, during the boiling process, take a longer time than usual to thicken, some of it is taken out and put into one of those pots in which the chips remain and which had just been strained. Whenever they find the liquid overflow the pot from excessive ebullition, they sprinkle a little bran on it to make it subside.

When the men return home in the evening, each with his billet of wood, they examine the liquid deposited in the *ául* or trough, and, for the purpose of drying the substance and rendering it more adhesive, they use a piece of old *kamli* (country blanket), with which they keep stirring the liquid for two or three hours. They use the *kamli*, as the kât (catechu) does not adhere to it, and it is left exposed during the night that it may cool and become firm. If after the usual time they find the *kát* continues rather moist, and that it does not appear to possess a sufficiently adhesive quality, they bury it in the earth for three or four days, after which it becomes dark and hard, but the people never eat kât of this description; it is used by masons who mix it with lime.

By dawn in the morning the females are at work again; they take the kát out of the troughs in masses, and place it in baskets, to permit any remaining liquid to run off more freely, and at the expiration of three or four hours, they take the baskets to the merchant. Here they divide it into small lumps about the size of a fig. They give ten of these lumps for a *dhabbu* (half anna). They will sometimes manufacture a sufficient quantity to allow of their disposing of the value of eight or ten *dhabbus* in one day.

When the Kátoris deliver the fresh kát to the merchant, it is placed on the ground in the shade to dry, with a quantity of small chips previously scattered over the place, to prevent the earth adhering to the kát. It takes three or four days to harden; during this time, each of the little lumps is turned over once a day, and gently pressed with the hand to accelerate the drying process. The kát must always be dried in the shade, for if exposed to the heat of the sun it would dissolve and turn black.

The Kátoris are paid for the greater part in such necessaries as they may be in want of, and whatever balance remains is credited by the merchant to liquidate the sum due to the village grain-dealers for giving the Kátoris permission to quit their villages.

The Kátoris thus employed are not permitted to sell kát to other persons, and the merchant, to guard against any roguery on their part, has their huts searched daily.

The heat in the months of April and May puts a stop to the manufacture, as the kát will not thicken and dry when the atmosphere is very warm.

When the whole supply of kát has been dried by the merchant's people, it is piled into long heaps or ridges, and previous to its being removed from the jungle to his own house, he deems it necessary to propitiate the goddess Bhaváni. Accordingly, a coarse green *sárhi*, a *choli*, some glass bangles, a small-toothed comb, and a string of beads are placed on one of the heaps of kát; then some turmeric, red pigment, a casket or small box and comb (करंडा फणी), red lead, a cocoanut, and frankincense are placed near the *sárhi*, after which a sheep and fowl are sacrificed at the shrine.

It is said that the merchant reckons that he receives about ten seers* of the kát for the rupee. (*Major A. Mackintosh, Trans. Bom. Geograph. Soc.*, i., p. 331, 1338.)

Cæsalpinia Sappan.

Schreder, in the *Berichte der Deutschen Chemischen Gesellschaft*, 1872, 512, and 1879, 506, has shown that *Sappanin*, the crystalline colouring matter of Sappan-wood, is *not* identical with Brasilin.

Alhagi camelorum.

Aitchison (*Notes on Prod. of W. Afghanistan and N.-E. Persia*, p. 8) says:—"After all other shrubs and plants have dried up owing to the autumnal hot winds, this still remains of a vivid green, and is eagerly sought for as fodder by camels, donkeys, and goats. During certain seasons, and in special districts, when its fruit is beginning to ripen, the whole shrub becomes covered with tears of glass-like beads, the largest the size of a pea; this is the Manna produced on this shrub, called in these parts *tar-anjabin*, which is very extensively collected, both for local consumption and exportation."

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* The full seer of eighty rupees' weight, 2 lbs.

The ground-nut oil trade in Pondicherry.

The ground-nut oil trade of Pondicherry has increased enormously during the last few years: twenty years ago the total quantity exported amounted to only 1,403 casks, the whole of which was taken by Mauritius and Réunion; during the twelve months ending 31st December 1890, the total shipment rose to 18,485 casks, 7,503 being consigned to Rangoon and Moulmein; large quantities were also taken by Calcutta, Coconada, Singapore, and Penang. The oil trade with Burmah, which scarcely existed eight years ago, has now risen to a steady demand for about 700 candies a month. The oil is put up in English beer hogsheads holding 440 lbs. each, and in Cochin oil casks containing 550 lbs. each. The tabulated tables given below show the total shipments, and the highest, lowest, and average prices for certain given periods. The ground-nut kernels are crushed exclusively by the ancient wooden presses of exactly the same pattern which have been used for several centuries; about 1,200 of these mills are employed in crushing the kernels—800 at Vilvanur, a village in the Villapuram taluq, eighteen miles west of Pondicherry, and 400 in Pondicherry and the neighbouring communes: the trade is entirely in the hands of native operators, who buy and crush the nuts, and ship and sell the oil without the intervention of any European agency. A company was started at Pondicherry a few years back for erecting and working a *huilerie* to be worked by steam power, and in due time the mill commenced crushing, but the results were unfavourable, the cost of working and of the raw material being largely in excess of the value of the oil produced; after persevering for upwards of two years, company No. 1 decided to close up the concern by liquidation; but for some time no purchaser could be found, and it was therefore resolved to sell off the property by public auction, but "bidders," were not forthcoming, and as a last expedient the factory *en bloc* was transferred to a small party composed of original shareholders, for a mere song. This company No. 2 soon came to grief, and finding the losses on working to be more than they cared to bear, the mill was again closed and advertised for sale. After a considerable delay a Calcutta firm bought the property, and having made various improvements in the machinery, set vigorously to work at crushing, but with no better result than that obtained by companies Nos. 1 and 2; and the factory was again closed for the third time in about as many years, and company No. 3 retired. And now the end of Pondicherry *huilerie* has come, and the machinery is being taken down and conveyed to Bangalore, where it is to be re-erected and worked for crushing ground-nut kernels: Bangalore has already one steam oil mill, and it has to be seen whether two can be made to pay. The complete failure of the several attempts made to work the Pondicherry factory is attributed to various causes, of which the following are the chief:—*First*, the inefficiency of the machinery generally, and of the engine and boiler in particular, which caused an extravagant consumption of fuel to obtain minimum results; *second*, the absence of a practical engineer thoroughly acquainted with oil crushing machinery; *third*, the want of a sufficient working capital so as to purchase the raw material, fuel, &c., in advance, when prices were low; and *fourth*, the want of unanimity among the owners. The results, however, were so far valuable, that they demonstrated the fact that the crushing of ground-nut kernels by improved steam machinery of a modern type would yield large profits, provided it was efficiently supervised and economically worked: it was found that the outturn from steam crushing was nearly 4 per cent. greater than what was obtained from native presses, while the quality of the oil was so much superior that it fetched fully 3½ per cent. more in the Burmah, Singapore, and Indian markets. The export of the ground-nut oil trade developed only about 1875, when 9,150 casks were shipped, including 1,581 to Bordeaux, 1,036 to Marseilles, 572 to London, 207 to Havre, and 200 to Martinique; but the trade with Europe stopped when Marseilles began crushing on a large scale, and during the last twelve years there have been no transactions. The use of the oil for cuisine purposes is extending every year, especially among all classes of Indians, and particularly with Indian emigrants working in foreign countries. The 12,000 casks shipped yearly to Burmah and Mauritius are consumed chiefly by Indians, and it is likely that Natal and other places where Indian labour is employed will presently become large consumers. Ground-nut oil is not much used by Europeans, as the taste of the kernel is rather strong, unless properly manipulated; many native cooks, however, clarify it so thoroughly that it is rendered tasteless, and equal, if not superior, to ordinary olive and salad oils. The process is a very simple one, but great care and judgment are necessary to insure success: if the clarifying secret were better known, the oil would, no doubt, to a large extent, take the place of *ghee*; it is much better for cooking purposes, far cheaper, and more readily transported, while it cannot be easily adulterated. The consumption of the *huile d'arachides* seems to follow on the track of Indian emigrants: in 1880 there were but very few Indians settled in Singapore, Penang, &c., and in that year the export of ground-nut oil amounted to only 10 casks; in 1890 the shipments to these two ports amounted approximatively to 1,800 candies. The future of the export oil trade seems to wear a decidedly bright appearance, and there is no apparent reason why the development of the last few years should not continue at the same ratio for at least some years to come. The value of the traffic to Pondicherry is very great: besides the labour required to work the native mills, employment is given to a large number of coopers and others in preparing and shipping the casks. The following statement shows the total number of casks exported for the periods named below:—

Number of casks	1885.	1886.	1887.	1888.	1889	1890.
exported	10,403	10,256	17,727	16,093	19,365	18,485

It will be seen by the above that the shipments during the last four years have not materially changed; the period of 1889 was exceptional, the ground-nut crop being unusually large, and the prices generally low.

The statement given below exhibits the highest, lowest, and average rates, per French candy of 529 lbs. English, during the several years mentioned:—

	1875.		1880.		1885.		1890.	
	Rs.	a.	Rs.	a.	Rs.	a.	Rs.	a.
Highest quotations per candy ...	49	0	70	0	67	0	86	0
Lowest per candy	32	12	51	14	52	0	55	0
Average do.	40	3	59	8	55	14	62	4

The exceptional low prices for 1875 are accounted for by the unexpected heavy crop of kernels, which was greatly in excess of the foreign demand, which caused the rates to rule low, and to offer unusually good advantages to local crushers. (*Times of India*, March 31st, 1891.)

PONDICHERRY, 27*th April* 1893.—The number of casks exported in 1892 was the lowest since 1887, in which year the purchases for

Upper Burma first commenced. The high price of kernels throughout the season was no doubt the main cause of the falling off, but it is noticeable that there was a considerable decrease in 1891, when both nuts and oil were comparatively cheap. The average number of casks shipped yearly from 1887 to 1890, both inclusive, was 18,068, as compared with 15,390 for 1891 and 1892. The average quotations of the oil, for the same periods, were Rs. 59 and Rs. 70, respectively, per French candy of 529 lbs. The trade with Calcutta, the Straits and Coast ports shows no signs of improvement, while Mauritius and Bourbon figures remain pretty much the same as in former years. The ground-nut oil trade—at least so far as its consumption is concerned—is an enigma. In Bourbon and Penang, where Indians monopolise the labour markets, very little of this generally indispensable culinary article is used, while in both Upper and Lower Burma the consumption is enormous, although the Indian population is, comparatively, very much less than it is in the former colonies. We must assume that the native Burmese is the better customer of the two. The price of the oil has risen in greater proportion than that of ground-nuts. In 1875 the highest quotation was Rs. 49 per candy and the lowest Rs. 32-12-0, when in 1892 the rates were Rs. 86-8-0 and Rs. 69, respectively. As in the case of the kernels—which are grown almost exclusively on British soil—the great bulk of the ground-nut oil shipped at Pondicherry is manufactured in English territory, the village of Valavanur, a station on the Pondicherry-Villapuram Railway, supplying the greater part. The trade is entirely in the hands of native operators. The approximate value of last year's shipments may be taken at 11¼ lakhs of rupees. For the current year the prospects are, so far, encouraging. In spite of the high prices of the kernels, the shipments from the 1st January to the 31st March amounted to 3,928 casks, as compared with an average of 3,888 casks for the same period during the preceding four years. The average price was Rs. 73,140 per candy, the highest Rs. 79-8-0, and the lowest Rs. 65-8-0, against Rs. 67-5-0, Rs. 83-8-0, and Rs. 58-12-0, respectively. (*Madras Mail.*)

Crotalaria paniculata.

Dr. Mootoosawmy, in March 1890, sent a specimen of this plant for identification. It is used as a fish poison in Tanjore and other places in Southern India, and is known by the Tamil name

Valithe-pundu. An alcoholic extract of the plant had a strong odour of henbane, and contained a soft resin, a tannin, and an alkaloid, the latter being the active principle. (*D.H.*)

Crotalaria retusa, *Linn. Bot. Mag.*, *t.* 2561 ; *Rheede, Hort. Mall. ix.*, *t.* 25.

Greshoff (*Med. uit. S'lands Plant*, vii., p. 31) has shown that the leaves of this common plant, the Bil-jhanjhan of Bengal, the Ghágri of Bombay, and Potu-galli-gista of Southern India, contain a considerable quantity of *indican ;* and that the seeds contain an alkaloid which is a strong poison, and is probably closely related to the poisonous alkaloids of Cytisus, Ulex, Spartium, and Lupinus.

The same base was found in larger quantity in the seeds of *C. striata*, DC. *Bot. Mag.*, *t.* 3200 ; *Reich. Icon. Exot.*, *t.* 232.

Millettia atropurpurea, *Bent. Wall. Pl. As. Rar.*, *t.* 78.

Greshoff (*Med. uit. S'lands Plant.*, vii., p. 33) has shown that the seeds contain a glucoside similar to, if not identical with, *saponin.* The plant is employed as a fish poison in the Dutch East Indies; it is also a native of Martaban, Tenasserim, Malacca, and Penang.

Pithecolobium bigeminum, *Mart.*

According to Greshoff, the bark contains 0·8 per cent. of a non-volatile, amorphous alkaloid, which forms crystalline salts, and separates as a heavy, yellow oil on the addition of alkalies to solutions of the latter. With 100 parts of water, it forms a turbid liquid, which on warming assumes the appearance of milk, but becomes clear on the addition of an acid. The solutions have a burning taste, and give the usual alkaloid reactions. It has a strong corrosive action on the skin, and is fatal to fish in a dilution of 1 : 400,000. The same compound appears also to occur in *P. Saman*, Benth. (*Meded. uit S'lands Plant.*, vii., p. 38.)

Derris elliptica, *Benth. Wight, Ic. t.* 420.

The roots of this handsome climbing shrub, according to the Kew Report of 1877, afford a useful insecticide for agricultural purposes, and are also used to kill fish. The Malays are said to use the bark as one of the ingredients of their arrow poison.

According to Greshoff (*Meded. uit. S'lands Plant.*, vii., p. 12) it has a powerfully poisonous action on fish, a decoction of the roots being fatal even when diluted with 300,000 parts of water. The only active constituent isolated is a resinous substance termed *derrid*, which does not contain nitrogen, and is not a glucoside; it readily dissolves in alcohol, ether, chloroform, and amyl alcohol, but is very sparingly soluble in water and potash solution. On fusion with potash, it yields salicylic and protocatechuic acids. It occurs almost entirely in the cortex of the root, but has not yet been obtained pure. Its alcoholic solution has a slightly acid reaction, and a sharp aromatic taste, causing a partial insensibility of the tongue, which remains for hours. A solution of 1 part in 5 millions is almost instantly fatal to fish. A very similar compound is found in the seeds of *Pachyrhizus angulatus*, Rich., a decoction of which is quickly fatal in a dilution of 1:125,000. It is probably identical with derrid, but until this has been experimentally proved it may be distinguished as *Pachyrhizid.* It is very readily prepared from *Pachyrhizus*, which occurs in all tropical countries, as the tannin compounds, usually so difficult to separate, are not found in this plant. The seeds also contain a non-poisonous, crystalline compound, which is readily soluble in alcohol, and has at 30° the consistence of butter.

Sophora tomentosa, *Linn.*

The plant formerly renowned as a medicine ("*Anticholerica Rumphii*") contains a poisonous alkaloid, soluble in ether, which is contained in largest quantity in the seeds. A small quantity of this substance, received by Professor Plugge as a thick red-brown fluid, when tested physiologically, gave results indicating the probability that it is identical with cytisine, the alkaloid of laburnum seeds, and this probability was strengthened by the results of such chemical and spectroscopical tests as were possible with the small quantity of material available (*Archiv. d. Pharm.*, ccxxix., 561). Alkaloids have previously been found in *S. speciosa* and *S. angustifolia*, but have not been closely investigated.

Abrin.

P. Ehrlich (*Deutsche Med. Wohenschrift*, 1891, No. 14) compares the toxic properties of Abrin with those of Ricin. Injected hypodermically, he finds abrin (Merck's) to be only half as poisonous as ricin; taken internally, it is still less active.

Subcutaneous injections in mice seldom produce the necrosis so commonly observed when ricin is injected, but invariably cause epilation at the seat of the injection. On the other hand, the action of abrin upon the conjunctiva is much more powerful than that of ricin. Ehrlich has succeeded in producing an immunity to the action of abrin similar to that obtained with ricin (*cf.* Vol. III., p. 305). Animals thus rendered refractory present a general and local immunity to the action of the poison; they bear without injury doses four times as large as those which would prove fatal to an unprotected animal, whether administered internally or injected beneath the skin. Absolute immunity of the conjunctiva to the action of abrin may be obtained by its internal administration for several weeks. From these facts the author concludes that a substance, which he calls anti-abrin, is developed in the blood which completely counteracts the action of the poison.

Immunity to the action of abrin affords no protection against the action of ricin, nor does the administration of ricin lessen the activity of abrin; a rabbit whose conjunctiva had been rendered insusceptible to the application of solid ricin suffered from an intense conjunctivitis when a solution of 1 : 10000 of abrin was applied to the part.

ROSACEÆ.

Otto of Roses.

The results of the investigations on Rose Oil, which have been carried on for a long time in the Pharmaceutical Institute of Breslau University, have been published by U. Eckart (*Archiv. der Pharmacie*, 229 [1891], 355). A body $C^{10}H^{18}O$, which is called "Rhodinol," forms the chief constituent of both German and Turkish otto; it boils at 216°—217°, and shows all the reactions of an alcohol. With acetic or benzoic anhydride it forms esters, which, however, during distillation, dissociate again into their constituents. By treatment with halogen hydro-acids, Rhodinol chloride $C^{10}H^{17}Cl$, Rhodinol iodide $C^{10}H^{17}I$, and so on, are obtained. Oxidation with potassium bichromate and sulphuric acid converts Rhodinol into an aldehyde, which the author calls "Rhodinal" and which is believed to be identical with Citral. By phosphoric anhydride Rhodinal is transformed in Dipentene in abstracting a molecule of water. (*Ber. von Schimmel & Co.*, Oct., 1891.)

COMBRETACEÆ.

Myrobalans.

G. Zoelfell (*Arch. der Pharm.*, 1891, 123—160) states that the tannin of myrobalans is a mixture of two tannins, one of which is the glucoside of gallic acid, yielding upon hydrolysis gallic acid and sugar (dextrose); the other tannin present is a tannic acid proper of the formula $C^{10}H^{10}O^{10}$, which at 100° C. loses two molecules of water. The anhydrous acid $C^{14}H^{6}O^{8}$ is called ellagic acid (the formula of which is generally given as $C^{14}H^{8}O^{9}$); the hydrated acid $C^{10}H^{14}O^{10}$ is called ellaggenic acid; the latter forms a penta-acetyl derivative, indicating five and four hydroxyl groups, respectively, in the acids. The tannins were separated by fractional precipitation with lead acetate, subsequently purified by precipitation with sodium chloride and solution in acetic ether.

Terminalia chebula.

Mr. A. Campbell Stark submitted a paper on the "Preliminary Proximate Analysis of a sample of commercial Myrobalans" to the Pharmaceutical Conference, August, 1892.

A finely powdered and well-mixed sample yielded 7·05 per cent. of moisture and 2·3 per cent. of ash—

Petroleum Ether Extract ...	Free fatty acid ...	·482
	Wax	·428
Ethereal Extract	Gallic acid	3·02
	Tannin	1·80
	Green resin	·54
	Brown resin	·97
Alcoholic Extract	Tannin	18·80
	Bitter principle ...	1·9
	Glucose	1·13
	Saccharose	1·25
	Phlobaphane... ...	·86
	Colouring matter ...	·35
	Pale green substance ...	·71
Aqueous Extract	...	5·10

The soft green resin found in the ethereal extract is presumably the "Myrobalamine" of Dr. Apery. The tannin was estimated in the aqueous solution of the alcoholic extract by means of copper acetate, including that also found in the ether extract: it amounted to 20·6 per cent., a lower percentage than that quoted by other investigators, who give the average of tannin in myrobalan from 20 to 40 per cent.

Terminalia belerica, *Roxb.*

We have made the following experiments with the seeds of the large-fruited variety of this tree (see Vol. II., p. 5, *et seq.*) :—9·5 grams of the kernels, equal to 22 in number, pulped with raw meat were eaten by a fasting cat at 11-40 A.M. At 2·30 P.M. the animal vomited several times, ejecting a number of worms and some fluid, but no meat. 4 P.M. vomited bile-stained, frothy fluid, looks somewhat distressed. No other symptoms were noticed, and on the following morning the cat was in its normal state.

Our experiments thus appear to indicate the absence of any narcotic principle, but a substance which possesses emetic properties is probably present.

MYRTACEÆ.

Clove Culture in Zanzibar.*

Zanzibar is noted for being the principal source of the world's supply of cloves, and a report on the cultivation of this article of domestic economy may prove of interest.

When speaking of Zanzibar, we include the islands of Zanzibar and Pemba, three-fourths of the entire crop of cloves being produced in Pemba. Those grown on the island of Zanzibar are reckoned of superior quality and command the better price, but this is probably due to the fact that the owners reside here, and can thus give their affairs the benefit of direct supervision.

Certainly the conditions for their successful cultivation are most favourable at Pemba, where the rainfall exceeds that of Zanzibar, but the management being left to careless overseers, the result is the cloves are imperfectly cured and (but little care being observed in handling) are frequently marketed in an inferior condition.

The clove tree was first introduced into this country by the then Sultan, Seyed Said bin Sultan, about the year 1830, since which time its cultivation has gradually extended, until it is now the chief industry of the islands.

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* Report of Consul Pratt. Reprinted from the *Oil, Paint, and Drug Reporter*.

The industry received a check in 1872, the date of the great hurricane. At least nine-tenths of the trees were destroyed at that time, so the larger part of those now standing are of new growth.

A peculiarity of the clove tree is that every part is aromatic, but the greatest strength is found in the bud, which is the "clove" of commerce. The finest quality of cloves are dark brown in colour, with full, perfect heads, free from moisture.

In the cultivation of the clove, the first thing to be done is the starting of the shoot. The seeds are planted in long trenches and are kept well watered until after sprouting. In the course of forty days the shoots appear above ground. They are carefully watered and looked after for the space of two years, when they should be about 3 feet in height. They are then transplanted, being set about 30 feet apart, and are kept watered till they become well rooted. From this time on the young trees require only ordinary care, though the best results are obtained when the ground about the trees is well worked over and kept free from weeds.

The growth of the tree is very slow, and five or six years are required for it to come into bearing, at which time it is about the size of an ordinary pear-tree, and is usually very shapely. It is a pretty sight to see a young plantation just coming into bearing. The leaves, of various shades of green tinged with red, serve to set off the clusters of dull-red clove buds.

As soon as the buds are fully formed and assume this reddish colour, the harvesting commences, and is prosecuted for fully six months at intervals, since the buds do not form simultaneously, but at odd times throughout the whole period. The limbs of the tree being very brittle, a peculiar four-sided ladder is brought into requisition, and the harvesting proceeds apace.

As fast as collected, the buds are spread out in the sun, until they assume a brownish colour, when they are put in the storehouse and are ready for market.

A ten-year-old plantation should produce an average of 20 pounds of cloves to a tree. Trees of twenty years frequently produce upwards of 100 pounds each.

The present season, commencing with July, 1889, is very favourable, and the crop will exceed that of any previous season. It will, in all probability, amount to 13,000,000 pounds, averaging a local value of 10 cents per pound.

The Sultan derives no inconsiderable portion of his revenue from this source, since the duty is levied at 30 per cent. *ad valorem*, thus placing to the Sultan's credit for the present year nearly, if not quite, $400,000.

Besides the clove buds, the stems are also gathered, and form an article of commerce, commanding about one-fifth of the price of cloves and having about the same percentage of strength. To this circumstance is due the fact that ground clove can frequently be purchased in the market at a lower price than whole cloves.

For the past fifteen years the cultivation of cloves has been the chief occupation of the Arab planters, and has always netted good returns. It seems probable that it will continue to be a profitable crop, since the consumption of the article appears to keep pace with the inevitable increase of production.

Up to the present time the plantations have been worked with slave labour at comparatively small expense; but with stoppage of slave supplies from the mainland, great difficulty will be experienced by the planters during harvest time. One result will be an increase in expenses; but what the planters have most to fear is that the curtailment of the labour-supply will entail a direct loss by rendering it impossible to harvest the crop until after it has blossomed, when it would be unfit for the uses of commerce.

Oil of Cloves.

The value of this oil depending upon the quantity of eugenol present, H. Thoms proposes the following method of assay, depending upon the formation of benzoyl-eugenol (see *Am. Jour. Pharm.*, 1891, 406): 5 gms. of the oil, 20 gms. solution of sodium hydrate (15 per cent.), and 6 gms. benzoyl chloride are placed in a tared beaker of 150 cc. capacity and thoroughly mixed, this causing the mixture to become quite hot; after cooling 50 cc. water are added and heat applied until the crystalline mass melts, and again allowed to become cold; the clear liquid is run through a weighed filter (dried at 101°C.), and the same operation of washing the crystals repeated twice with 50 cc. water. To remove the sesqui-terpene, which may contaminate the benzoyl-eugenol, the crystals have to be washed with alcohol; this is effected by adding to the still moist crystalline mass in the beaker 25 cc. alcohol of 90 per cent., warming until solution is effected, rotating the solution until the crystals begin to separate again, then allowing the contents of the beaker to cool to 7° C.; transferring to the weighed filter and washing with a little 90 per cent. alcohol until the filtrate measures 25 cc.; the filter with contents is then at once transferred to the beaker, dried at 101° C. and weighed. To the weight of the benzoyl-eugenol must be added 0·550 gm., the amount soluble in 25 cc. 90 per cent. alcohol; this weight multiplied by 164 (the molecular weight of eugenol) and divided by 268 (the molecular weight of benzoyl-eugenol) gives the amount of eugenol in 5 gms. oil; for the percentage multiply again by twenty.

An examination of sixteen samples showed the eugenol to vary from 76·87 per cent. to 90·64 per cent.; the oil distilled from the stems was found (contrary to expectations) to contain a high percentage of eugenol, 83—85 per cent.; the specific gravity of the oil was not found to agree with the percentage of eugenol as the following show: 1·059 = 83·2 per cent.; 1065 = 80·89 per cent.; 1·065 = 82·77 per cent.; 1·0615 = 84·10 per cent.; 1·0655 = 90·64 per cent.; 1·061 = 81·18; this led to the belief that there must be a third constituent present in the oil, for if there were only eugenol and sesqui-terpene the specific gravity should vary in accordance with the percentage of eugenol. (*Pharm. Centralhalle,* 1891, 589. *Am. Journ. Pharm.,* Jan., 1892.)

PASSIFLOREÆ.

Carpaine, the alkaloid in the leaves of Carica Papaya.

A new alkaloid has recently been detected in papaw leaves by M. Greshoff, of the Chemico-Pharmacological Laboratory at Buitenzorg in Java. It was obtained by digesting the powdered leaves in spirit acidulated with acetic acid, removing the spirit by distillation, and treating the resulting extract with water so as to leave behind resin and chlorophyll. The aqueous solution was then shaken repeatedly with ether, and carbonate of soda was added until an alkaline reaction was evident. The precipitate thus obtained was readily soluble in ether, and on evaporation of the ether the "carpaine" was obtained in colourless rosettes of crystals to the extent of about 0·25 per cent. of the leaves employed. Although the freshly pecipitated alkaloid is readily soluble in ether, when once crystallized it redissolves but slowly, so that the crystals can be purified and rendered perfectly white by washing with a little ether, but the percentage obtained is thus reduced to 0·15 per cent. On a large scale the lime and petroleum method gives very good results, about 0·19 per cent., and would probably be preferred on the score of expense. Comparative experiments made on the young and old leaves freed from the stalks show that the old leaves afford when dried 0·072 per cent. of the alkaloid, the young leaves 0·25 per cent., and that on an average a papaw plant can be calculated to afford 30 grams of the alkaloid per year from the leaves. The hydrochlorate of carpaine, which contains about 82 per cent. of the pure alkaloid, is freely soluble in water. As yet comparatively little is known of the physiological action of the alkaloid. It appears, however, to act more especially upon the heart, slowing its action. The lethal dose for a fowl of 500 grams weight was found to be about 200 milligrams. In a fowl of 350 grams weight no poisonous symptoms were produced with 50 milligrams of the alkaloid; with 100 milligrams symptoms of poisoning occurred in ten minutes after injection into the breast muscles, but after twenty-five minutes the animal recovered its normal condition. The bird lay on its side and breathed deeply in a jerky manner, and showed slight convulsive movement of the whole body, but no irritability was noticed. Further observations are necessary to determine the usefulness or otherwise of the alkaloid in medicine; should it prove of utility, there can be no difficulty in obtaining it in almost unlimited quantity and in a definite crystalline condition. The alkaloid is easily precipitated from its solutions by the alkaloid reagents. The most delicate reaction is with Mayer's reagent, iodoiodide of potassium, which in a solution of 1 in 300,000 gives a turbidity, and in 80,000 parts an evident precipitate; phosphomolybdate of ammonium has its limit of reaction at 1 in 75,000 parts, picric acid at 1 in 30,000, and chloride of gold at 1 in 25,000. The alkaloid has a bitter taste, which is perceptible even in a solution of 1 part in 100,000.

CUCURBITACEÆ.

Constituents of Melon Seeds.

C. Forti (*Chem. Centr.*, 1890, ii., 581) found these seeds to contain cholesterin and a dextro-rotatory carbo-hydrate apparently belonging to the galactan group.

The oil yielded by the seeds to ether amounts to 49 per cent., and is almost free from fatty acids. It contains lecithin. The phosphorus amounts to about 0·02 per cent. (*Year-Book of Pharm.* 1891, p. 194.)

UMBELLIFERÆ.

Anethum.

(*Peucedanum graveolens*, Benth.)

A distillate from Indian dill seed is reported to have shown besides a difference in the aroma, a considerable variation in chemical composition from oil distilled from German seed. From the distillate from Indian seed there was a remarkable separation of a constituent heavier than water, the nature of which has not yet been determined. The specific gravity reached 0·970, and the optical, rotation +41° 30′. German dill oil consists of limonene and carvol and has an average specific gravity of 0·910. (*Ber. von Schimmel & Co.*, Oct., 1891.)

Dorema Ammoniacum.

Under the name of بریو (bury) we have received from Afghanistan the root of this plant.

Anisun.

Under this name we have received Hemlock fruit from Afghanistan.

ARALIACEÆ.

Panax Ginseng.

Davydow (*Pharm. Zeitschr. f. Russl.*, 1890, pp. 97, 113, 130) has taken up the analysis of this root made by Garrigues (*Am. Jour. Pharm.*, 1854, p. 511). For panaquilon he uses the following process: The finely powdered root is repeatedly extracted with cold water until it shows no acid reaction. The several aqueous extracts were united and treated with animal charcoal, filtered and evaporated to dryness. The residue is dissolved in boiling 95 per cent. alcohol, filtered, and the alcohol recovered. Panaquilon remains as an amorphous, light yellow mass, easily soluble in alcohol and water, insoluble in ether, and does not contain nitrogen. Concentrated sulphuric acid gives a blood-red colour, gradually turning to a reddish violet. Panaquilon is neither an alkaloid nor a glucoside. On boiling with dilute sulphuric acid a crystalline powder, panacon, separates, which is insoluble in water and ether, but soluble in alcohol. Concentrated sulphuric acid dissolves and colours it purplish red.

Concentrated nitric acid oxidizes it to oxalic acid. Garrigues gives the following formulæ: Panaquilon $C^{24}H^{25}O^{18}$, Panacon $C^{22}H^{19}O^{8}$ $(O=8)$. (*Am. Journ. Pharm.*, July, 1890.)

RUBIACEÆ.

Randia dumetorum.

Sir J. Sawyer (*Lancet*, Mar. 21, 1891) has employed a tincture of the fruit made with spiritus etheris, B. P., as a nervine calmative and antispasmodic; the dose is from 16 to 30 minims in water, but the strength is not stated. We have already shown that the drug contains saponin and valeric acid.

Ixora parviflora.

P. S. Mootoosawmy has sent us a sample of the bark of this tree, with the remark that it is used in native medicine, mixed with a decoction of ginger, for anæmic diseases; he suspected the presence of iron in it. The bark contained a little fatty matter, tannin, red colouring matter and 11·5 per cent. of ash consisting of the usual constituents, with only a trace of ferric oxide. The decoction of the bark was of a deep red colour, which probably suggested its medicinal employment.

Note on Catechu.

In the Library of the Botanic Garden at Oxford I recently came across a book which apparently escaped the observation of the indefatigable authors of *Pharmacographia*, entitled "Ehrenfridi Hagendornii Medicinæ D. et Pract. Gorl. Tractatus Physico-Medicus de Catechu sive Terra Japonica in vulgus, sic dicta ad normam Academiæ Naturæ-Curiosorum. Jenæ, 1679." This gives very interesting particulars respecting the history, nomenclature, and physical characters of Catechu.

"De patria Catechu." The author writes:—"Si Catechu agnomen respicias, quod Japonica etiam indigitetur, facilis esset decisio, quem agnoscat *locum natalem*. In ambiguo tamen usque est, an in Japonica vel præparetur vel aliunde ad Japonenses transporteter. Ex aliis finitimis locis in *Malaccam* et Sinam exportari." The italics are mine.

"De differentiis Catechu," "Duplicis generis quod sciam, innotuit Catechu hactenus. Una magisque communis Catechu species apparuit rubicundior, ad nigredinem veluti quandam inclinans, cum striis albicantibus, instar linearum per totum Catechu subjectum excurrentibus, itemque ponderosior compacturque. *Altera* a me visa fuit compacta, nec ita colorata, colore potius ad albedinem inclinante, porosior item, levioris ponderis, digitis quoque frangi facile terrique sustinens, nec Rae rubicundioris, ceu altera, adeo ferax."

Other differences are noted. Whether the pale variety alluded to be the cutch of North India I am unable to say. May it not be the Gambier cutch? If so, this will be a very early notice of that drug.

In another chapter of "De Electione Catechu" the writer says:—"Usus obtinuit, ut si de notis bonitatis indijudicandis medicinalibus certiores esse velimus, ad manus asservemus exemplum quoddam, ad quod tanquam ad Lydium lapidem pensiculanda pensiculemus eaque si bonitate cum examplo conveniant, retineamus sin minus, aversemur. Hinc cum duæ hactenus Catechu species sese mihi obtulerint, illam putaverim alteri preferandam, que saturatiori se commendat rubedine, quæ compactior, quæ ponderosior, quaque minus participat de lapillis, seminibus, lignis aliisque inibi interdum repiriri solitis. Quâ fini etiam apud aromatarios jam receptum est, ut integros Catechu globos prius malleo contundant, visuri, quænam sit species, ne pallidiore et viliore ob metum adulterationis, qua Japonenses ut plurimum malè audiunt, emptores defraudent.

"Sec. 2. Notari tamen expedit, suggerente id qualicunque experientiâ meâ utramque suam mavere posse laudem: *Rubicundiorem* cum opus est peculiari multaque adstrictione; *Pallidiorem* vero, ubi magis præcipitandi et absorbendi, humores vitosos intentio est, modo prius probe à lapillis et depuretur."

Section 3 is devoted to the 'Pharmaceutica'; section 4 to 'Therapeutica.'

One prescription may be quoted, for it gives an example of the early use of the word chocolat—

℞ Conserv. rosar-antiq.	℥j.
Flor borrag	℥ss.
Chocolat	ʒij.
Catechu	ʒj.

Vin. Malvat. q. s. cum ∴ cinnam, rosar. ā. g. j. M. sic viro cuidam primario in eructatione ventriculi, quâ præmodum constictabatur. (*By G. Claridge Druce, Pharm. Journ., Jan.* 1892.)

VALERIANEÆ.

Valeriana Wallichii.

Aitchison (*Notes on Prod. of W. Afghanistan and N.-E. Persia*, p. 96) states that *gur-bâlchorak* is a trade name for the roots of this plant in Afghanistan. He remarks:—"A Kabul trader at Leh told me that it was the same as *gur-balchorak* in the Peshawur trade, and owing to a load of which he was once nearly driven mad in conveying it from Kabul to Peshawur, by all the cats in the country surrounding him at night, wherever he halted." Aitchison supposes the name to be a contraction of *Gurba-bálchorak*, which would signify "the cat valerian."

COMPOSITÆ.

Solidago Virga-aurea.

Dr. Mascarel is said (*La France Médicale*, Oct. 8, 1889) to have used the plant very successfully in cases of dropsy. It has long been used by country practitioners to produce diaphoresis. It grows plentifully in the Northern parts of the United States, and resembles *Sol-odora*, the "sweet-scented golden rod," or "blue-mountain tea." In administering it for cardiac dropsy, Dr. Mascarel reduces the dried plant—stems, leaves and flowers—to a coarse powder, and gives it in doses of one tablespoonful, beaten with an entire egg (yolk and white). He gives but one dose on the first day; but on each of the following days he adds a tablespoonful, until seven or eight doses are being taken during the twenty-four hours. The diuresis is said to continue until œdema permanently disappears.

Helenin in Tuberculosis.

Helenin has now for some time been before the medical public as a remedy in phthisis, but without any apparent progress in its use. Dr. T. J. Bokenham has published an account of numerous experiments made by him as to the real value of the substance, and so far as can be gathered from the account given in the *British Medical Journal* (Oct. 17, p. 838) it would appear that the crystalline bodies occurring in *Inula Helenium* are difficult to separate on a large or commercial scale, and that consequently alantic anhydride was the only substance procurable commercially for his experiments. The other crystallized bodies were, however, obtained in sufficient quantity for laboratory experiments. These experiments showed that any of the crystalline bodies would prevent the growth of the tubercle bacillus if present in the proportion of 1 in 10,000, and in any ordinary cultivating medium for this bacillus. The effect of the administration of the alantic anhydride appeared to be to prolong life for a time in the animals experimented on, but not to prevent a fatal result. Helenin has also been lately given with good results in leucorrhœa in the dose of 2-4 centigrammes (*Rép. de Pharm.*, Oct., p. 481). (*Pharm. Journ.*, Oct. 31, 1891.)

Pluchea lanceolata.

Description.—Shrubby, hoary pubescent, with sessile, very coriaceous, oblong or oblanceolate entire leaves, one to two inches in length, having strong very oblique nerves on both surfaces. When dry, the leaves are of a pale yellowish-green. Heads of flowers in compound corymbs about the size of Groundsel, purple, involucre bracts contracted at the mouth, outer bracts obtuse, hoary. The drug has no marked taste.

Chemical composition.—The taste of these leaves is saltish and aromatic. They yield, in an air-dried state, 16·93 per cent. of mineral matter, consisting largely of alkaline chlorides, the cubical crystals of which were deposited on inspissating the alcoholic and aqueous extracts of the plant. Caoutchouc, and an organic-acid giving a green precipitate with ferric salts, were present, but no alkaloid. We have tried some experiments with preparations of Pluchea leaves, and conclude that, weight for weight, they are much weaker than senna leaves in their cathartic action.

The Existence of a Mydriatic Alkaloid in Lettuce.

The attention of the author was drawn a few months ago to the mydriatic action of an extract prepared at Hitchin from common lettuce, *Lactuca sativa*, when in flower. On examination, the mydriatic action was found to be due to an alkaloid. The extract closely resembled belladonna extract in appearance, smell, and taste; but a dose of 5 grains had been taken without injurious effects. Three other commercial extracts of lettuce were examined—namely, an extract of wild lettuce, *Lactuca virosa*, prepared according to the directions of the British Pharmacopœia, the history of which was unknown, and extracts of both the wild and the cultivated lettuce prepared at Market Deeping, in Lincolnshire. An extract of that variety of the cultivated plant known as Cos lettuce was also examined. They all contained an alkaloid which had a very marked power of dilating the pupil of the eye. Finally, a dried specimen of wild lettuce, collected when in flower, was examined. It contained a mydriatic alkaloid.

The impure alkaloid obtained from the extract was a light brown syrup, which possessed powerful mydriatic properties. In order to purify it, it was converted into the oxalate. The alkaloid recovered from the pure oxalate, when crystallized from chloroform, closely resembled hyoscyamine, both in appearance and in melting point. The aurochloride was then produced by the usual methods, and this, after recrystallization, was obtained in the shining flat needles characteristic of the aurochloride of hyoscyamine. The estimation of the gold and the base in this compound showed that the alkaloid was one of three isomeric mydriatic alkaloids, having the formula $C^{17}H^{23}NO^{3}$, while its melting point was 159·75° (corr.), and closely corresponded with that ascribed by Ladenburg to the aurochloride of hyoscyamine. The plant does not appear to contain a second mydriatic alkaloid, although it must be remembered that only small quantities of material were operated upon.

The author has just shown that both wild and cultivated varieties of lettuce, especially when the flowering stage is reached, contain hyoscyamine, the mydriatic alkaloid occurring in *Hyoscyamus niger*, *Atropa Belladonna*, and other plants belonging to the natural order *Solanaceæ*, and it is probable that to the presence of this alkaloid the sedative and anodyne properties of extract of lettuce are due.

That this important constituent has been until now overlooked is probably due to the fact that in chemical investigations upon lettuce the dried milk sap, lactucarium, has alone been examined, although its value as a sedative and anodyne is by no means established. The author found that lactucarium of both English and German manufacture was devoid of mydriatic properties and contained no alkaloid whatever.

The fact that lettuce contains a poisonous alkaloid is not of great importance in connection with its use as a vegetable, since it is only used for this purpose in the early stages of its growth, before the bitter milk has been produced, when the hyoscyamine is only present, if at all, in minute quantities. The amount of mydriatic alkaloid in the extract prepared from garden lettuce when in flower is not more than 0·02 per cent. Nevertheless, cases have been recorded in which the immoderate consumption of lettuce has led to unpleasant and even fatal results. Lettuce belongs to the natural order *Compositæ*. This is the first occasion on which hyoscyamine has been found in plants not belonging to the natural order *Solanaceæ*. (*By T. S. Dymond, from the Research Laboratory of the Pharmaceutical Society of Great Britain.*)

Tagetes erecta.

The flowers contain a crystallizable substance *quercetagetin*, having the composition $C^{27}H^{22}O^{13} + 4H^{2}O$; it is the yellow colouring matter; its reactions in alcoholic solution are the same as those of quercetin, but it differs from the latter in crystalline form and solubility in alcohol. (*Bull. Soc. Chim.* [27] xxviii., 337.)

Saussurea Lappa.

Schimmel & Co. in their Report (April, 1892) state that Kusht root yields one per cent. of a light yellow essential oil, which possesses a sp. gr. of 0·982, and a rotatory power of + 15° 20′ in a tube of 100 mm. It begins to boil at 275°, and about one-half goes over below 315°; then complete decomposition takes place, producing a very disagreeably-smelling vapour. When treated with soda, a part of the oil combines with it, and can be separated by acids. The root has a violet odour, but it does not seem to yield an odorous oil of that perfume. Messrs. Schimmel state that the odour of the oil resembles at first that of elecampane. After the volatilization of this odour, in about 24 hours, the violet odour develops, but not sufficiently strong to indicate that the oil could be of practical use.

Mr. McDonell, Conservator of Forests in Kashmir, reports that the plant grows as high as 9,000 to 10,000 feet. The dried root sells at Rs. 25 per maund. It is collected by villagers and paid for at Tehsils. The chief purchaser is a Bombay Chinaman.

CAMPANULACEÆ.

Lobeline.

The only active principle of *Lobelia inflata* has recently been investigated by Dr. H. Dresser.

Warm-blooded animals poisoned by means of lobeline succumb to respiratory paralysis, so it is to be included among the respiratory poisons. In dogs the physiological action of lobeline is first manifested by a paralysis of the voluntary movements and by a concomitant exaggeration of the reflexes. Later these effects are complicated by a paralysis of the motor nerves, analogous to that produced by curare. Through its paralyzing action on the cardiac branch of the pneumogastric, lobeline resembles in its action the nicotine group. In warm-blooded animals the influence of lobeline is found in a great exaltation of the respiratory activity. It produces an acceleration of the respiratory movement, which is more persistent when the pneumogastric nerves are intact than when they have been divided. Further, the amplitude of the respiratory movements is increased, and the power of the respiratory muscles appears to be also augmented. Under the influence of comparatively small doses of lobeline, the inhibitory influence of the pneumogastric on the heart, as well as its action on the bronchial muscles, is suppressed. The respiratory muscles appear to receive especial stimulation from the respiratory centre when the latter is under the influence of lobeline ; as a result, the work accomplished by the heart and respiratory muscles is greatly augmented. In comparison with the other agents which stimulate the respiratory functions, lobeline possesses the advantage over hydrocyanic acid in its freedom from depressing action, while it surpasses aspidospermine in energy. It therefore seems evident that the employment of lobeline as an anti-asthmatic is substantiated by experimental facts, though the author has not made any clinical experiments and offers no suggestions as to the proper form of employment of this alkaloid. (*Archiv. für Experimentelle Pathologie und Pharmacologie*, 26 Band, Heft 3 und 4.)

H. Paschkis and A. Smita (*Akademie d. Wissen.*, *Wien*, April 17, 1890, through *Chem. Zeit.*, 1890, 594) use the following method for preparing lobeline : The herb of *Lobelia inflata* is extracted with water, acidified with acetic acid, the extract partly evaporated, made alkaline and extracted with ether. An extract was taken up with water and being acid was made alkaline and shaken with ether. The ether was evaporated and the alkaloid obtained as a thick oil of a yellow colour. For purifying, the alkaloid was dissolved in ether, shaken with water acidulated with hydrochloric acid, then made alkaline and taken up with ether. This was repeated three times, the ethereal solution then dried with potassium hydrate, and the ether distilled in an atmosphere of hydrogen. The free alkaloid or the sulphate was suspended in 10 per cent. potassium hydrate solution and treated with 4 per cent. potassium permanganate, until the green colour disappeared only slowly. The mixture was then filtered, acidified with sulphuric acid, extracted with ether, this evaporated and residue recrystallized from water. This proved to be benzoic acid. (*Am. Journ. Pharm.*, July, 1890.)

PRIMULACEÆ.

Anagallis arvensis.

A. Schneegas (*Journ. Pharm. von Els. Lothr.*, 1891, 171) has separated from this plant two glucosides identical with those obtained from quillaia and senega. The plant is said to be used in Mexico as a substitute for soapwort.

SAPOTACEÆ.

Indian Gutta-percha.

The natural sources of supply of gutta-percha, and the possibility of their exhaustion, were referred to in the *Kew Reports*, 1876 (p. 23); 1887 (pp. 30, 31); and 1881 (pp. 38-45). A few trees, natives of the Indian peninsula, yield substances more or less similar to gutta-percha. One of these is *Dichopsis elliptica*, Dalz. (=*Bassia elliptica*, *Isonandra acuminata*).

The following note on this plant appeared in the *Report of the Royal Gardens, Kew*, 1881, p. 44 :—

"This tree appears to be common on the Malabar Coast, the forests of Coorg, the Wynaad, Travancore, &c. It grows to a height of 80 or 90 feet. A substance similar to the gutta-percha of commerce is procured by tapping, but the tree requires an interval of rest of some hours, or even of days, after frequent incision. In five or six hours upwards of 1½ lbs. was collected from four or five incisions. The gum is hard and brittle at the ordinary temperature, but becomes sticky and viscid on the increase of heat. It is not found applicable to all the purposes for which gutta-percha is used, but 20 or 30 per cent. of it may be mixed with gutta-percha without destroying its qualities."

The same tree is referred to in Watt's *Dictionary of the Economic Products of India*, Vol. III., p. 102. In this, an extract taken from Drury's *Useful Plants of India*, suggests that the gum might be usefully utilised as a sub-aqueous cement or glue; or that, on account of its perfume when heated, it might possibly be rendered of some value to the pastille and incense makers. More recently this gum has been analysed by Mr. David Hooper, F.C.S., F.I.C., Quinologist to the Government of Madras, and the results are given in the *Annual Report of the Cinchona Plantations of Madras* for 1891, p. 18:—

"*Indian Gutta-percha.*—An abundance of gutta-percha milk has been yielded during the dry weather in the Wynád by the Panchotee tree (*Dichopsis elliptica*), and some planters have been asking for information on the subject, and inquiring whether it could be made into a commercial article. The milk has been known for some years to afford what was called Indian gutta-percha or Pala-gum, and has been used as an adulterant of Singapore gutta. General Cullen brought it to notice 35 years ago, and Dr. Cleghorn published a memorandum on the subject at the time. It was reported upon by experts in London, who found that it was unfit for water-proofing purposes, as its solution in coal-tar and turpentine dry up to such a brittle consistence that the fabric is useless. It could be used as a birdlime or cement, and keeps well under water as a cable insulator, especially if mixed with some genuine gutta. By boiling the milk of the Panchotee tree, a white mass separates, which can be kneaded by the fingers, but which becomes hard and brittle when cold. The brittle character of this substance, I find, is due to a large proportion of a crystalline substance found also in true gutta, and called crystalban or alban. Crystalban, according to Payen, occurs to the extent of 14 to 19 per cent. in the best kinds of gutta-percha, but I have extracted as much as 69·2 per cent. of crystalban from the dried secretion obtained from Wynád. The presence of a large quantity of crystals in this gum, of course, would interfere with its utility, but crystalban is easily removed by boiling alcohol, and the residue consists of a very good and pure gutta-percha. I cannot see why this process could not be used to purify the Indian gum and so obtain an article similar to the Malayan article."

A note on a gum from a closely allied plant (*Dichopsis obovata*, C. B. Clarke) received at Kew from Burma appeared in the *Kew Bulletin*, 1892, p. 215. (*Kew Bulletin*, Dec. 1892.)

STYRACEÆ.

The Varieties of Benzoin.

The source of the different varieties of gum benzoin known to commerce, and many points regarding the mode of preparation of the drug, are still, to a large extent, matters of conjecture. Some authorities, including Dr. Treub, the well-known director of the Buitenzorg botanical gardens, are of opinion that Penang and Palembang benzoin are yielded by the same tree, and that the difference in the appearance and in the yield of cinnamic acid of the two kinds is caused by differences in their mode of preparation. Mr. Holmes does not agree with this view, but inclines to the belief that the Sumatra and Palembang varieties are both produced by the same tree—styrax benzoin—and that the Penang gum is *sui generis*, probably the produce of the *Styrax subdenticulata*, Miq., which occurs in Western Sumatra. Hanbury offers no definite opinion on the subject, nor does Flückiger, in his last edition, just published, of the *Pharmacognosie.* Contributions to the elucidation of a subject upon which so much divergence of view exists among authorities are always welcome, and they become doubly valuable when they are the result of careful local examination. In London the druggists distinguish four varieties of benzoin, *viz.*—Siam, the costliest variety; Sumatra, which comes next in value ; Penang, which is a comparatively recent addition to our Materia Medica, and Palembang, the kind mostly used by benzoic-acid manufacturers. Leaving Siam gum, which is obtained from the mainland of Asia, out of account altogether, it is evident that the nomenclature of the remaining three varieties is not only altogether fanciful, but actually calculated to mislead. In Penang itself no benzoin is produced, and the gum which is imported by way of that great emporium of the trade of the Dutch East Indies is almost entirely, if not wholly, collected in the island of Sumatra. Palembang gum also is the produce of the same island, Palembang being simply the chief settlement of the residency of the same name, in the south-eastern part of the island of Sumatra, where a great part of the benzoin of commerce is brought to market, and whence it is sent on to Singapore or Penang on its way to Europe. Sumatra, though it has been nominally under Dutch rule for over two centuries, still contains some of the least-known spots on earth, and the detailed account of the cultivation and collection of benzoin in one of the remoter districts of the island, which we owe to Mr. L. M. Vonck, a member of the Dutch-Indian Civil Service, stationed at Sekajoe, in Sumatra, and which is published in the last issue of the Journal of the Netherlands Society for the Advancement of Industry, is, therefore, an acceptable addition to our knowledge of the collection of this important drug and the manner in which it passes into commerce. Mr. Vonck does not refer to the gum, of which he speaks either as Palembang, Penang, or Sumatra benzoin, and it may, therefore, be taken for granted that those classifications are unfamiliar to him. The gum of which he writes, and which appears the only kind brought into commerce from south-eastern Sumatra, is evidently all obtained from one tree, and seems to correspond with the kinds known to our druggists as Penang and Palembang. So far as his evidence goes, therefore, it certainly favours Dr. Treub's opinion that there is no difference between the commercial source of Penang and Palembang benzoin. The benzoin-tree (*Styrax Benzoin*, or, in Malay, pohon Kemenjan, or Menjan) occurs, according to Mr. Vonck, in various portions of the high and low lands of the residency of Palembang. It grows up to an altitude of about 600 feet above sea-level, either in small clusters or sporadically between other trees. Formerly little attention appears to have been paid to benzoin-culture. At any rate, the standard writers on the products of the Dutch Indies only mention benzoin as being collected from wild-growing trees in the virgin forests of the Upper Blitie, on the Lalang and Toengkal rivers, and in the wilds of Batang Lakoh in the country of the Koeboes. But the easy nature of the culture, and the high prices which good benzoin realised in former years (from £6 to £8 10*s*. per picul), acted as strong incentives to the extension of the plantation. There are only a few parts of the residency of Palembang in which the benzoin-tree is either scarce or non-existent. In some other districts the tree is found wild, but its gum is never collected, nor is the tree cultivated systematically. The principal districts in which the benzoin-tree is systematically cultivated in gardens are the divisions of Iliran, Banjocasin, and Moesi Ilir. In the Koeboe country, already referred to above, in the virgin forests of which the benzoin-tree was formerly of very common occurrence, it has now almost been extirpated. The tree flourishes in various kinds of soil, but experience shows a high, dry sandy soil, free from danger of inundation, to be most fitted for its propagation. On low-lying, rich, and clayey soil the tree grows up more rapidly, but its gum is then of such a poor quality that the cultivation yields little or no profit. On such a soil there is also danger of floods, which are fatal to the tree. Marshy or stony soil is altogether unsuited to the culture. The tree is propagated from the seed, which is of a reddish colour, almost round in shape, and of the size of a marble. It is enclosed in a green shell. When the would-be planter has gathered a sufficient quantity of the seeds, which are a favourite food of wild beasts of the forest, he plants them out in rows in the paddy-field, just before the paddy crop is put in the ground. Sometimes the young benzoin-shoots which have grown up around the parent stem are dug out and transplanted among the paddy. The object of the plantation on the paddy-field is to secure the necessary shade for the seedlings, which would be easily killed by the fierce sunlight. Two seeds are usually planted in one hole; if both come up, the weaker plant is generally destroyed. If the culture takes place by means of young shoots from the parent tree, these shoots, before planting, are stripped of their leaves, and placed in water in bunches of about twenty-five, being kept afloat between two bamboo sticks. When fresh leaves have grown upon the shoots, they are planted out in an oblique hole, which is left open for a time. The new benzoin-tree grows from the roots of the young shoot, after which the stem of the latter perishes. The natives appear to take no trouble whatever in weeding their benzoin plantations, and many of the plants are therefore suffocated by creepers and weeds. Only after a lapse of seven years the native returns to the spot where he planted his seeds or shoots for the purpose of gathering his first crop of juice. By that time the shoot has grown into a fine tree, branching and bearing leaves at the top only, and from 25 to 40 feet in height. When once the tapping of the tree has commenced, its growth is almost arrested, and the colour of its bark gradually changes from pale grey to brown. If the tree is left to grow wild, its height trebles or quadruples, some of the specimens in the virgin forest being over 250 feet high. The incisions made in the tree are almost triangular in form, and are made at regular intervals and on a systematic and invariable plan. A yellowish juice begins to exude from the incisions a week after they are made, but not until six weeks or two months after its appearance has it hardened sufficiently to admit of being collected. The tree becomes exhausted between its seventeenth and its nineteenth year, the drying-up process commencing at the lower part. The natives collect three different qualities of gum, classed according to the lightness of their colour and their freedom from bark and other impurities. A full-grown benzoin-tree yields from 1 to 3 catties ($=1\frac{1}{3}$ to 4 lbs.) every season, and its cultivation is a source of considerable affluence to its proprietor. In the Moesi Ilir District several proprietors own from 500 to 7,000 benzoin-trees each. During the recent years of low prices, however, the cultivation has been carried on with great want of care, and in some parts a garden of 2,000 trees now yields hardly as much gum as a garden of 500 trees did when, some years ago, the collection of gum was carefully attended to. Still, the benzoin-producing villages of Sumatra are among the most prosperous in the whole island. If, through carelessness, as sometimes happens, the collection of the gum from some trees is forgotten during the season, the gum, after some months, is found to have exuded in great lumps, which have become quite hard, and are covered with a dirty layer of black. These pieces are cut from the trees with an axe, and roughly rinsed in the nearest creek. Afterwards hot water is poured over this gum, which softens it and renders it fit for packing. Palembang is the trade centre for the district, and the Chinese merchants there are the principal, if not the only, buyers. They systematically adulterate the benzoin by the addition of inferior gum-resins, wood, or earth, and it is said that for many years not a single parcel of pure benzoin has been exported from Palembang. The average benzoin exports from Palembang are about 700 tons per annum. Mr. Vonck mentions that the gum exported from Padang on the west coast of Sumatra is more valuable than that brought into commerce from Palembang. This has sometimes been ascribed to its greater richness in cinnamic acid, but Mr. Vonck believes it to be due rather to the greater care which is bestowed upon its collection. As the Penang and Palembang gums are the least valuable on the London market, and their prices correspond most nearly to the figures given by Mr. Vonck as the local value of the gum, equalling from about 5*s*. to 40*s*. per cwt.; this may be taken as additional evidence in favour of the view that the Palembang and Penang varieties are identical, and that the gum known in London as "Sumatra" is the product of the western districts of Sumatra, and may possibly be obtained from a different tree. (*Chemist and Druggist*, Sept. 26, 1891.)

An interesting paper on the origin of Benzoin by Fritz Lüdy appeared in *Archiv de Pharmacie*, 231-43, an abstract of which is contained in the *Pharm. Journ.*, April 29, 1893.

APOCYNACEÆ.

Rauwolfia serpentina, *Benth.*

Note on certain reactions of an alkaloid contained in the roots.

In the *Pharmacographia Indica*, Vol. II., p. 416, one of us described the proximate composition of the root of the *Rauwolfia serpentina*, Benth., and noted the presence of one or more alkaloidal principles. This communication deals chiefly with the colour reactions of an alkaloid which we have separated from the roots, and provisionally termed pseudobrucine.

The isolation of the alkaloid in a pure condition was attended with difficulty. In our first experiments, the pounded root was exhausted with boiling 80 per cent. alcohol, and the alcohol free extract treated with cold water acidulated with sulphuric acid, by which a large amount of dark resinous matter was separated. The aqueous acid solution was then precipitated with Mayer's reagent, but the precipitate on decomposition did not yield the alkaloid in a pure condition, owing to a certain amount of resinous matter being precipitated with the alkaloid by the reagent, and which was subsequently dissolved by the amylic alcohol employed to separate the alkaloid after its liberation from the mercury compound. Attempts were made to separate dissolved resinous matter from the aqueous acid solution of the alkaloid by agitation with amylic alcohol, but the sulphate of the alkaloid was freely soluble in this alcohol. In ether the alkaloid was only very slightly soluble. Ultimately, the pounded root was percolated with chloroform, the chloroform evaporated off, and the extract treated with water acidulated with sulphuric acid. The acid aqueous solution of the alkaloid was then agitated with chloroform, which separated some colouring matter and a trace of alkaloid. The chloroform was then separated and the acid solution made alkaline with sodic carbonate and reagitated with chloroform; this series of operations being repeated several times. The final chloroform extract was dried and agitated with ether, which removed traces of colouring matter. The extract now formed a cinnamon-coloured powder, extremely bitter, soluble in dilute acids, and dissolving in amylic alcohol or chloroform with a very marked greenish fluorescence. An alcoholic solution of the alkaloid did not crystallize, and we failed in obtaining distinctly crystalline salts. A solution of the alkaloid in dilute sulphuric acid afforded with alkaline carbonates and hydrates a bulky white precipitate; but even after repeated precipitation and re-solution, the physical characters of the alkaloid were not materially altered, and its solution in amylic alcohol or chloroform still showed a marked fluorescence. A solution of the alkaloid in dilute sulphuric acid, when agitated with animal charcoal, completely lost its bitterness, the solution being at the same time completely decolourized. The alkaloid could be again separated from the charcoal by treatment with warm alcohol, the physical characters being unaltered.

The following colour reactions were noted, pure brucine being tested at the same time as a control:—

Reagent.	Brucine.	Alkaloid suspected to be Brucine.
Conc. sulph. acid containing a trace of nitric acid.	Pink	Yellow.
Conc. hydroc. acid ...	Colourless	Yellow.
Acetic acid	Colourless	Yellow.
Conc. nitric acid ...	Scarlet, soon passing into yellow.	Scarlet, does not become yellow so soon as the brucine, but only after standing for some time.
Sulph. acid and bichromate of potash.	Yellow, with tinge of red ...	Slight purple, not unlike the strychnia reaction, but not so marked.
Sulph. acid and MnO^2.	Orange	Violet, changing to dark brown.
Chlorine	Red: colour soon discharged, decolourized by ammonia.	Red: colour not so soon discharged, decolourized by ammonia.
Mercurous nitrate, with slight excess of HNO^3.	Pink on warming, colour deepens on standing.	Yellow on warming, but no pink colour.
Mayer's reagent ...	Pale yellowish ppt., flocculent.	Pale yellowish ppt., flocculent.
Nitric acid and $SnCl^2$.	Purple, discharged by excess of both reagents.	No purple colour.
Sulphuric acid and potassium nitrate.	Red, changes soon into yellow.	Red, with greenish-purple tint at the edges; red colour deepens on standing.
Sulphocyanide of potassium.	White ppt., sol. in excess of acetic acid, repptd. by NaHO.	White ppt., sol. in excess of acetic acid, repptd. by NaHO.

Reagent.	Brucine.	Alkaloid suspected to be Brucine.
Bichromate of potassium in acetic acid solution.	Copious yellow ppt., with difficulty soluble in large excess of acetic acid.	Copious yellow ppt., with difficulty soluble in large excess of acetic acid.
Platinic chloride ...	Thick yellowish floc. ppt., with difficulty soluble in acetic acid, but with exception of a few flocks completely soluble in NaHO.	Thick yellowish floc. ppt., readily soluble in acetic acid, but almost insoluble in NaHO.
Auric chloride ...	Dirty white floc. ppt., soon changing to flesh colour, soluble in excess of acetic acid, but insol. in NaHO.	Beautiful purplish-red ppt., soon changing to dirty brown, with a green tinge, sol. in excess of acetic acid, but insol. in NaHO.
Potassium ferrocyanide.	Light yellow ppt., soluble in dilute H^2SO^4. The presence of acetic acid in slight excess prevents precipitation.	Light yellow ppt., sol. in dil. H^2SO^4. The presence of acetic acid in slight excess does not prevent precipitation.
Alcoholic solution of iodine.	Alcoholic solution of alkaloid, rosette crystals.	Alcoholic solution of alkaloid, no crystalline forms on microscopic examination.

Two experiments were made to determine whether the alkaloid possessed any physiological properties similar to brucine. In the first experiment ·15 gramme was dissolved in three drops of acetic acid diluted with about two drachms of water, and injected into a cat's stomach at 11-21 A.M.

11-37 A.M.—A quantity of half-digested food was vomited; there was a good deal of frothy mucus and constantly dribbling saliva, movement of the jaws, and application of the paws to the mouth as if to remove some irritant matter; the animal restless and much distressed.

12-30 P.M.—Frothy mucus and saliva still flowed from the mouth, but in smaller amount; vomiting ceased, but now and then retches; animal not so restless..

1 P.M.—Discharge of saliva ceased; animal quiet, no further symptoms developed.

In the next experiment ·022 gramme of the alkaloid was dissolved in acetic acid, the solution evaporated to dryness, the residue dissolved in a few drops of distilled water, and the solution hypodermically injected into the left hind leg of a small frog at 11-40 A.M.

The frog was placed under a large glass funnel and jumped about, a tap on the glass being sufficient to make it change its place.

11-44 A.M.—Frog showed no inclination to move; when its back was touched with a glass rod it made feeble attempts to move its limbs; some loss of power was evident, but there were no twitchings of the limbs or convulsive movements.

11-46 A.M.—The frog did not move its limbs even when tapped on the back; the left leg appeared quite paralysed.

11-50 A.M.—The limbs were quite lax, and might be placed in any position without the animal making any effort to move them. When placed on its back, it now and then made feeble attempts to move the right leg; then the movements stimulated slight twitchings. After this, and until its death at 12 noon, it lay motionless, the only sign of vitality being an occasional gasp; limbs flaccid, no convulsions. As a control experiment, another frog, a little larger, was injected with the same amount of brucine. Two minutes after the injection it was perfectly motionless; there was evidently loss of voluntary power over the limbs. When placed on its back and touched, it made no effort to move, but slight twitchings of the limbs were noticed, which became more marked in about a couple of minutes. Touching the back, pinching the limbs, or even gentle tapping on the table, was now sufficient to produce rather feeble convulsive movements, but there was no spasm, except when thus regularly induced. The frog died about ten minutes after the injection. After death the limbs were not stiff but rather flaccid.

Many of the reactions we have described as being afforded by the alkaloid we have provisionally termed pseudobrucine were identical with those yielded by brucine; while, on the other hand, certain reactions were quite different. The history of the drug shows that it is employed as a domestic remedy in the treatment of a large number of affections, but there is no evidence to indicate that it is supposed to possess any toxic properties. When we are satisfied that we have obtained the alkaloid in a pure state, its ultimate composition, &c., will be determined. (*C. J. H. Warden and Assistant Surgeon Chuni Lal Bose, Pharm. Journ.*, Aug., 1892.)

Oleander as a diuretic and heart-tonic.

F. v. Oefele (*Pharm. Pr.*, Oct. 24, 1891, pp. 2-5) draws attention to the action of this plant as a diuretic and heart-tonic in place of digitalis. He considers an infusion of the fruit to be preferable to all other preparations: the infusion may be preserved from deterioration by the addition of a little glycerine or spirit. Dr. von Oefele considers that a maximum dose of $\frac{2}{3}$ of a gram of the raw drug or its equivalent in solution should not be exceeded in the 24 hours. (*Nouveaux Remédes*, Jan. 24, 1892.)

Hunteria corymbosa, *Roxb.*, *Wight Ic.*, *tt.* 428, 1294; *Bedd. For. Fl. ii.*, *t.* 265.

The bark of this tree, a native of the Deccan Peninsula, Coromandel Coast, Tavoy, Penang, and Ceylon, has been shown by Greshoff (*Meded. uit S'lands Plant.*, vii., p. 55) to contain 0·3 per cent. of a crystalline alkaloid, which also forms crystalline salts, and gives a beautiful violet coloration with Erdmann's and Fröhde's reagents. It is a strong poison, and has a sharp, burning taste, even when diluted to 1: 10,000.

Vinca pusilla.

This plant is called Mulakapundu in Tamil, and the ryots of South Arcot say that if cattle graze upon it they become giddy and die. We have chemically examined this plant, and find that the poisonous property is due to an alkaloid named *Vincine*, which is distinguished by giving a carmine-red colour with pure nitric acid.

ASCLEPIADEÆ.

Gymnema sylvestre.

In doses of 0·3 to 0·4 gram, gymnemic acid acts as an emetic. In much smaller doses it is stated to be very effective for distinguishing the taste of bitter drugs. For this purpose a $\frac{1}{2}$ per cent. aqueous solution containing a small addition of alcohol is used for rinsing the mouth immediately before taking the medicine.

The acid is obtained by moistening the powdered plant with a solution of caustic soda, allowing the moist mass to stand in a percolator for two days, and then extracting with benzin. After removing the benzin from the percolate by distillation, the residue thus left is repeatedly washed with ether and dried. The product forms a brownish crystalline powder, which is soluble in 100 parts of water, freely soluble in alcohol and insoluble in ether and chloroform. It is decomposed by acids. (*A. Quirini*, *Pharm. Zeitung*, 1891, 401.)

LOGANIACEÆ.

Strychnine in snake-bite.

An interesting illustration of the antagonistic action of poisons is given in a letter we have received from Mr. W. Rushton, addressed to his brother in Tasmania by Dr. Mueller, of Yackandandah, Victoria, in which he states that in cases of snake-bite he is using a solution of nitrate of strychnine in 240 parts of water mixed with a little glycerine. Twenty minims of this solution are injected in the usual manner of a hypodermic injection, and the frequency of repetition depends upon the symptoms being more or less threatening, say from 10 to 20 minutes. When all symptoms have disappeared, the first independent action of the strychnine is shown by slight muscular spasms, and then the injections must be discontinued unless after a time the snake-poison again reasserts itself. The quantity of strychnine required in some cases has amounted to a grain or more within a few hours. Both poisons are thoroughly antagonistic, and no hesitation need be felt in pushing the use of the drug to quantities that would be fatal in the absence of snake-poison. Out of about one hundred cases treated by this method, some of them at the point of death, there has been but one failure, and that arose from the injections being discontinued after one and a quarter grain of strychnine had been injected. Any part of the body will do for the injections, but Dr. Mueller is in the habit of making them in the neighbourhood of the bitten part or directly upon it. (*Pharm. Journ.*, June 13, 1891.) These results are opposed to the experiments instituted by the Commission appointed in India to investigate the influence of artificial respiration, intravenous injection of ammonia, &c., in Indian and Australian snake-poisoning (1874). More recently, A. A. Kanthack (*Jr. Physiology*, Vol. XIII., Nos. 3 and 4, 1892) has shown that strychnine is neither a chemical nor physiological antidote of cobra-albumose ; and he is of opinion that "no false hopes should be raised or fostered as to a cure by strychnia."

BORAGINEÆ.

The active principle of the Borogineæ.

Schlagdenhauffen and Reeb have examined the roots, stalks, leaves, and seeds of *Cynoglossum officinale* and *Heliotropium europæum.* Petroleum ether extracted from the roots a coloured substance analogous to alkanet red. By subsequent treatment with alcohol an alkaloid was obtained which the authors term *cynoglossine*. It is hygroscopic, combines with acids, forming uncrystallizable salts which are decomposed at 100° C. The base was also found in the seeds, but not in the leaves or stalks. Cynoglossine has a toxic action; injected hypodermically 0·001 to 0·002 gram caused violent convulsive movements in a frog, followed by death after several hours. 0·050 gram repeated several times caused nausea and vomiting in a pigeon and death without convulsions. In a rabbit weighing 3·500 kgs. a dose of about one gram produced narcotism and convulsive movements. (*Pharm. Post*, xxv., 1.)

We have received from Afghanistan, under the names of *Gaozaban* and *Gul-i-gaozaban*, the leaves and flowers of *Trichodesma molle*, DC.; and Aitchison (*Notes on Prod. of W. Afghanistan and N.-E Persia*, p. 12) records the collection of the corollas of *Anchusa italica*, Retz., to be employed as *Gul-i-gaozaban*.

SOLANACEÆ.

Lycopersicum esculentum, *Miller*.

The tomato fruit has been chemically examined by G. Briosi and T. Gigli. On an average the fresh fruit contains: Seeds 10·9 per cent., pulp 85·4 per cent., and skin 3·7 per cent. The pulp can be separated into a yellow juice and a red residue, which is tasteless after washing; the juice on an average has the specific gravity 1·0217, and contains levulose, citric acid (0·4 to 0·65 per cent. of the juice), albuminoids, and ash which is composed of 60 per cent. potassium salts. Minute traces of alkaloid are indicated; tartaric acid could not be detected. The red residue will impart its colouring matter to ether, alcohol, chloroform, and aqueous alkalies. The alcoholic solution is not changed by ferric chloride, dilute acids or alkalies; on addition of strong nitric acid a transient blue colour is produced; the residue on evaporating the alcoholic solution becomes blue by adding sulphuric acid; the colouring matter resembles that of saffron. (*Chemiker Ztg.*, 1891, 205.)

Mr. Frederick Davis has found that English-grown tomatoes subjected to distillation with water afford a volatile substance analogous to oil of onions or garlic. The crude oil obtained by distilling twenty-eight pounds consisted of oxide and sulphide of allyl. The crude oil was acted upon by metallic potassium to separate the oxygenated product, and the pure oil removed; this upon analysis proved to be represented by the formula $(C^3H^5)^2S$. (*Year-book of Pharmacy*, 1892, p. 515.)

Solanaceous Alkaloids.

The surprising statement made rather more than three years since, by Messrs. Schering, that belladonna roots contain practically only hyoscyamine, and that atropine obtained from them is probably a product of change occurring during the manufacture, suggested to Dr. Schütte to undertake a thorough investigation of the subject, and he has just published his results in a long and interesting paper (*Archiv*, Oct. 30, p. 492). In the first place the influence of methods of preparation upon the conversion of hyoscyamine into atropine was tested. Dr. Will had already stated that contact with an alkali is sufficient to effect this change, and Dr. Schütte found that the same result is produced by repeated recrystallizations from acidulated water, as well as by long keeping of hyoscyamine in solution or in the form of a gold salt. It was further ascertained that in fractional precipitation the gold salt of atropine, if any should be present, is thrown down before that of hyoscyamine, and the inference has been drawn that if any atropine gold salt be thrown down at the commencement of the precipitation in a properly-conducted experiment, it represents atropine existing as such in the plant-part, and that any obtained from a mother-liquor after the removal of the hyoscyamine represents a product of alteration. The influence of age and period of vegetation upon the alkaloids in the roots was next investigated. It was found that young fresh roots (1 to 2 years), collected from a basaltic district, whether gathered in the spring, summer or autumn, contained only hyoscyamine, but that older roots (8 years and upwards) always contained, besides much hyoscyamine, a little already-formed atropine. Similar results were obtained with roots from old cultivated plants and roots that had been kept several years. The amount of alkaloid was considerably greater in the roots collected in summer than in the spring roots, and fell off again in the autumn, but more rapidly in the old than in the young roots. The averages obtained at the three periods were for young roots 0·127, 0·452, and 0·458 per cent., and for old roots 0·174, 0·358, and 0·280 per cent. Spring and autumn leaves of the belladonna plant both contained principally hyoscyamine, with small quantities of ready-formed atropine. As to the fruit, the unripe berries of the wild plant contained chiefly hyoscyamine and a little atropine, but the ripe fruit contained only atropine. The ripe berries of cultivated plants, however, yielded both hyoscyamine and atropine, while the ripe berries from var. *lutea* gave atropine and a small quantity of a base probably identical with Hesse's atropamine. Turning to other Solanaceous plants, fresh and old stramonium seeds yielded chiefly hyoscyamine, together with small quantities of already-formed atropine, and scopolamine. The leaves of the potato plant (*Solanum tuberosum*), besides yielding betaine, gave indications of the presence of an alkaloid having a mydriatic action, which seemed also to resemble a mydriatic base present in *Solanum nigrum* and *Lycium barbarum.* The leaves of *Nicotiana tabacum* also yielded traces of a mydriatic alkaloid, and lastly the seed, herb, and root of *Anisodus luridus* all contained hyoscyamine only. (*Pharm. Journ.*, Nov. 28, 1891.)

Tobacco Smoke.

Tobacco-smoke varies in character according to the proportion of air admitted during combustion, oxidation being necessarily more perfect in the case of a cigar than when the tobacco is smoked in a pipe. In the latter case, a portion of the condensible products is deposited in the liquid state. Tobacco-smoke consists in part of permanent gases, the proportions of carbon dioxide and carbon monoxide in which have been determined by G. Krause. Vohl found sulphuretted hydrogen and hydrocyanic acid, and from 0·7 to 2·8 grammes of ammonia for 100 of tobacco smoked. Vohl and Eulenberg (*Arch. Pharm.*, [2], cxlvi., 130) experimented on the smoke of strong tobacco, burnt both in pipes and in the form of cigars. The smoke was first aspirated through a solution of caustic potash, and then through dilute sulphuric acid. The alkali absorbed carbon dioxide, sulphuretted hydrogen, hydrocyanic, formic, acetic, proponic, butyric and valeric acids, phenol and creosote; the presence of caproic, caprilic and succinic acids could not be ascertained conclusively. The acid absorbed ammonia, pyridine, C^5H^5N, and all the homologues of the series to viridine, $C^{12}H^{19}N$, inclusive. In addition to the above, carbon monoxide, methane, and several hydrocarbons of the acetylene series were detected. Pyridine was the chief base in the smoke from pipes, while collidine was the prominent base in cigar-smoke. Vohl and Eulenberg conclude that the nicotine of tobacco is completely decomposed during the process of smoking, and that the intense action of tobacco-smoke on the nervous system is due to the presence of bases of the pyridine series. There is no doubt that some observers have mistaken these bases for nicotine; but Melsen's experiments (*Dingl. Polyt. Jour.*, xlvii., 212) appear to be conclusive as to the presence of nicotine, which that chemist isolated in a condition fit for analysis, and to the amount of about 3·3 grammes for 4½ kilogrammes of tobacco smoked, or about one-seventh of the quantity originally present. (*Allen's Com. Organ. Anal.*, iii., pt. 2.) A. Gautier has since observed that the volatile liquid products formed when tobacco is smoked in a pipe consist chiefly of basic compounds. They contain a large proportion of nicotine, a higher homologue of nicotine $C^{11}H^{16}N^{2}$, which pre-exists in tobacco leaves, and a base $C^{6}H^{9}NO$, which seems to be a hydrate of picoline. Other less volatile bases, including hydropyridines, are also formed. These alkaloids result from the decomposition, at a comparatively low temperature, of the carbopyridic and carbohydropyridic or analogous acids present in tobacco. (*J. Chem. Soc.*, April, 1893.)

The alkaloidal contents of the Seeds and Tincture of Datura Stramonium.

The principal constituents of stramonium seeds, according to Flückiger and Hanbury's *Pharmacographia* (p. 461), are an alkaloid, existing in combination with malic acid, and a fixed oil, of which the seeds are said to contain 25 per cent. The alkaloidal constituent was first isolated by Geiger and Hesse in 1833, and in 1850 was submitted to examination by Von Planta, who came to the conclusion that it was identical with atropine. This statement was subsequently confirmed by E. Schmidt (*Ber. der Deutsch. Chem. Ges.*, xiii., 370), who, however, afterwards modified his views, and concluded that daturine was really a mixture, in varying proportions, of atropine and hyoscyamine (*Archiv. der Pharmacie*, xxii., 329).

Ladenburg also showed (*Berichte Chem. Ges.*, xiii., 909) that stramonium contains two alkaloids, which he designated heavy and light daturine, the former consisting of atropine and hyoscyamine, and the latter of hyoscyamine only.

As to the distribution of the alkaloid in the plant, and the comparative strength of the seeds and the leaves, very little reliable information is obtainable.

Hurtz and Hopp (*Annal der Therap.*, 1862, p. 22) inferred, from experiments made by them, that an extract from the seeds possessed five times the physiological activity of an extract from the leaves. Evidence of this kind is, however, of very little value unless the proportionate amount of extract obtained from the seeds and the leaves is stated, as the yield varies within wide limits. The alkaloidal content of the seeds is given in *Pharmacographia* as ·1 per cent. and that of the leaves as ·02 to ·03 per cent.

Hurtz (*Druggists' Circular*, Aug., 1884) reports having obtained a yield of daturine from the seeds of ·167 per cent.

E. Schmidt (*Year-book of Pharmacy*, 1885, p. 242) obtained from 5 kilos of each of four specimens of seeds, 12·5, 18·4, 2·6, and 10·2 grams alkaloid, equivalent to a percentage yield of ·25, ·37 ·05, and ·20 respectively.

A. B. Lyons (*Manual of Practical Assaying*), estimating the alkaloid by titration with Mayer's solution, found the average yield of alkaloid by five specimens of the seeds to be from ·45 to ·55 per cent., and that from eight specimens of the leaves to be ·40 to 25 per cent.

If these results could be trusted, they would appear to indicate that the percentage of alkaloid in the seeds and leaves is practically the same, but the process of estimation by titration with Mayer's solution almost invariably gives results which are too high, and a systematic examination of a number of samples of the seeds and leaves, with a view of ascertaining their relative alkaloidal strength, is still needed.

For the purpose of our experiments, eleven specimens of stramonium seeds were obtained, and a series of tinctures made from each, by the B. P. process, with menstrua of 80, 70, 60, 50, and 40 per cent. strength (by volume). It was remarked that all the tinctures became opalescent when kept, and all threw down a more or less abundant deposit. The latter varied greatly in appearance, that from the 80 and 70 per cent. tinctures apparently consisting of fatty matter in a semi-transparent crystalline condition, while the deposit from the tinctures of lower alcoholic strength was darker in colour and appeared to partake more of a resinous character.

In addition to the seed tinctures, we also prepared, for the purpose of comparison, three series of tinctures from the leaves, menstrua of the same alcoholic strength, and the same proportion of drug to menstruum being used, as in the case of the seed tinctures.

Before proceeding to the quantitative estimation of the alkaloid, a few preliminary experiments were tried, in order to ascertain whether the process employed for the estimation of the alkaloid in tinctures of henbane and belladonna was equally well adapted for the estimation of the stramonium tinctures.

For this purpose 300 c.c. of a standard tincture was prepared with a 60 per cent. menstruum, and the alkaloid estimated by the following processes, the usual precautions being taken to prevent loss of alkaloid in washing with chloroform, &c.:—

Experiment I.—Fifty c.c. of the tincture was evaporated to low bulk with addition of water, until all spirit had been removed. The residual liquor was allowed to cool and was then acidified with dilute sulphuric acid, and freed from fat and colouring matter by means of chloroform. It was then made alkaline, and the alkaloids removed by shaking with three successive portions of chloroform. From the mixed chloroformic solutions the alkaloids were extracted by three agitations with acidulated water, and were afterwards regenerated from the mixed acid solutions, after addition of excess of ammonia, by shaking out with chloroform. The latter solution was then shaken with ammoniated water, and after separation was drawn off and evaporated, and the residue dried at 100° and weighed.

Experiment II.—The tincture was evaporated to low bulk, the residual liquor allowed to cool, and an excess of dilute sulphuric acid added. It was then freed from fat and colouring matter by means of chloroform, a slight excess of ammonia added, the alkaloids shaken out with three doses of chloroform, the latter solutions mixed, and after treatment with ammoniated water evaporated, and the residue dried and weighed.

Experiment III.—The tincture was evaporated till all spirit was removed, and the residual liquor acidified with dilute sulphuric acid and shaken with chloroform and ether in turn, till the latter came away colourless. The alkaloidal solution was then made alkaline with ammonia, the alkaloids shaken out with three successive 15 c.c.

ether (sp. gr. ·717), the mixed ethereal solutions evaporated, and the residue dried and weighed.

Experiment IV.—The tincture was evaporated to remove the spirit, the residual liquor acidified, and colouring matter removed by means of chloroform. It was then made alkaline and the alkaloids extracted with chloroform. From the chloroformic solution the alkaloids were removed by agitation with acidulated water, the latter solution treated with a slight excess of ammonia; the alkaline liquid shaken with three successive portions of ether (sp. gr. ·717), and the mixed ethereal solutions evaporated, and the residue dried at 100°, and weighed.

Experiment V.—This was conducted exactly as No. II., the oil being removed by means of petroleum ether before the preliminary treatment with chloroform.

The results were as follows:—

Experiment I. 50 c.c. tincture = ·014 gram alkaloids.
Experiment II. 50 c.c. „ = ·015 „
Experiment III. 50 c.c. „ = ·012 „
Experiment IV. 50 c.c. „ = ·010 „
Experiment V. 50 c.c. „ = ·014 „

These results indicated that the method of extraction by means of chloroform was thoroughly reliable, notwithstanding the presence of fixed oil in the tincture, and also showed that the preliminary treatment with petroleum ether, in order to remove the oily matter, was unnecessary. Confirmatory experiments with a 70 per cent. tincture, by processes II. and V., gave the following results:—

No. II. 50 c.c. tincture = ·015 gram alkaloids.
No. V. 50 c.c. „ = ·014 „

The exact details of the process adopted are as follows:—

Fifty c.c. of the tincture to be estimated is introduced into a porcelain dish, and evaporated over a water-bath to low bulk; water being added, if necessary, until all the spirit is removed. The residual liquor is allowed to cool, and is then acidified by the addition of 1 c.c. semi-normal sulphuric acid, and the liquid filtered through cotton wool into a separating funnel. The dish and filter are rinsed first with a little acidulated water and then with 15 c.c. chloroform, the rinsings added to the contents of the funnel and the whole well shaken. After separation the chloroform is drawn off, and the process repeated with 10 c.c. chloroform. The washings are mixed and freed from traces of alkaloid by shaking with three successive small portions of acidulated water, and these are separated and added to the original solution. The latter is then made alkaline with ammonia, and the alkaloids extracted with three successive 15 c.c. chloroform. To obtain the alkaloids in a pure condition, they are withdrawn from solution in chloroform by agitation with three successive small portions of acidulated water, the mixed acid solutions made alkaline with ammonia, and the alkaloids taken out by agitation first with 10 c.c. and then with two successive 5 c.c. chloroform. In cases where the final acidified aqueous solution was not colourless, the process of shaking out was repeated. The mixed chloroformic alkaloidal solutions were afterwards shaken with ammoniated water, and after separation were drawn off and evaporated over a water-bath, and the alkaloidal residue heated at 100° until the weight was constant.

The above process was found to be applicable to the majority of the tinctures without any modification; but with others greater difficulty was experienced than had been the case in any of the estimations previously made.

This arises from the fact that in many specimens of stramonium seeds there seems to exist some substance soluble both in alcohol and water, and not removable by chloroform either from an acid or alkaline liquor, and which possesses the property of emulsifying chloroform when that liquid is shaken up with a solution containing it.

No difficulty was experienced in removing the oil and colouring matter, but when the extract was made alkaline and shaken with chloroform, emulsification took place, and the chloroform refused to separate out clear, even after standing for some hours. Separation into two layers did, however, take place, the upper layer consisting of a brown alkaline mother-liquor, and the lower layer of emulsified chloroform containing the alkaloid in solution, and holding in suspension some of the mother-liquor. It was ascertained that all the alkaloid was taken out by the chloroform, and two processes were devised, whereby it could be extracted from the chloroform emulsion and obtained in a pure condition. By the plan first adopted, the original alkaline liquor was shaken with three successive 15 c.c. chloroform, and after separation these were drawn off in turn and mixed. The mixed chloroformic solutions were then shaken up with four successive small portions of acidulated water, by which means all the alkaloid was taken out, together with the mother-liquor included in the chloroform magma, and the latter separated out clear. The acid solutions were mixed and made alkaline, and the alkaloids again shaken out with three successive portions of chloroform. The latter were drawn off and mixed and the process repeated (usually five or six times) until a point was reached where the alkaloidal solution became almost colourless, and a perfectly clear chloroformic solution was obtained. When this point had been attained, the alkaloids were once more extracted with acidulated water, the latter solution made alkaline, the alkaloids again taken out with chloroform, the chloroformic solution shaken with ammoniated water, and after separation drawn off and evaporated and the residue dried at 100° and weighed. The loss of alkaloid by this process is very slight, and there is no waste of chloroform, the same portion being employed all the way through for shaking out the alkaloids, a fresh quantity being used only for the final extraction of the pure alkaloid. The process, however, was a very long and tedious one, each estimation occupying four or five hours.

The following modification was found to give reliable results, and to shorten materially the time occupied by each estimation :—

The chloroform magma is introduced into a separating funnel and shaken vigorously, when, as a rule, about half the chloroform separates out and can be run off. To the remaining emulsion 5 c.c. of 90 per cent. alcohol is added and the whole well shaken and then allowed to stand, when a perfect separation into two layers takes place, the lower layer consisting of chloroform and alcohol, and the upper layer of a brown alkaline aqueous liquid. The whole of the alkaloid is taken out by the chloroform. The latter is drawn off and added to the portion previously separated and the alkaloid extracted by shaking with three portions of acidulated water. The acid solutions are mixed and made alkaline and the alkaloids recovered by means of chloroform. This process is once repeated, and the final chloroformic solution, after shaking with ammoniated water, is drawn off and evaporated, and the residue dried at 100° and weighed. These two modifications of the process of estimation were tried side by side on four of the most troublesome samples of tincture, and the results in each case were exactly concordant.

The alkaloid as obtained by either of these processes is in the form of a perfectly colourless, transparent fused mass. It is soluble in water and dilute acids, and the reactions generally correspond with those of the alkaloidal residue obtained from the belladonna tinctures.

A glance at the table will show that the most perfect exhaustion of stramonium seeds is effected by the use of a 60 or 70 per cent. menstruum, the average yield of alkaloid by the tinctures prepared with menstrua of these strengths being equal. It is open to question, however, whether a better preparation could not be obtained from the leaves. The chief objections to the tincture prepared from the seeds are that it almost invariably becomes turbid and deposits when kept, and also becomes opaque on dilution, which objections do not apply to a ,50 per cent. tincture of the leaves.

The results of the examination of the leaf-tinctures are appended to the table. The leaves from which No. 1 series was prepared were gathered from plants grown by one of us (Farr), and the deficiency of alkaloid is doubtless accounted for by the persistent rain and lack of sunshine which characterized the past season. The tinctures made from the other two specimens, however, gave the same average of alkaloid as the seed-tinctures. Lyons' results, referred to above, go to show that the alkaloidal strength of the seeds and leaves is the same, and should this fact be established as the result of further work upon the subject, we should recommend that this tincture, like those of henbane and belladonna, be prepared from the leaves, on the ground that a 50 per cent. tincture of the leaves is a more elegant pharmaceutical product than a 60 per cent. tincture of the seeds.

The results tabulated go to prove that the alkaloidal content of stramonium seeds does not vary to anything like the same extent as does that of most other drugs, the yield of the tinctures varying between the limits of ·020 and ·034, with an average of ·026 per cent.

This tincture, like those of henbane and belladonna, readily admits of standardization, and the standard should be fixed not lower than ·025 per cent.

The average amount of alkaloid contained in the seeds, calculated upon the basis of our results, is about ·2 per cent.

The percentage amount of the extractive in tinctures was ascertained by evaporating 10 c.c. of the sample over a water-bath, heating the residue at 100° till the weight was constant, and multiplying the result by ten.

It will be remarked that the last five series of tinctures show a much higher yield of extract than the first six, and it will also be noticed that the difference is more marked in the case of the tinctures prepared with the stronger menstrua. This discrepancy is accounted for by the fact that series 1—6 were made, as the Pharmacopœia directs, from the bruised seeds, while the drugs employed in the preparation of series 7—11 were reduced to somewhat fine powder before being converted into tincture. We have previously pointed out, in connection with the tinctures of conium and colchicum, that it is not advisable to reduce the drug to a fine state of disintegration. The sole result, in the case of stramonium seeds, is to expose the oily albumen to the free action of the menstruum, and as a consequence to load the tinctures prepared with the stronger menstrua with a quantity of oily and in all probability inert matter. This is proved (as was the case with tincture of colchicum) by the remarkable variation in the yield of extractive, by the tinctures of higher and those of lower alcoholic strength. As a general rule, the weaker the menstruum, the greater the percentage of extractive in the resulting tincture, but in the case of seed-tinctures this rule is reversed.

Table showing Quantitative Results of Estimation of Samples of Tincture of Stramonium Seeds.

No. of Sample.	Amount of alkaloid in grams from 100 c.c. tincture.					Amount of extractive in grams from 100 c.c. tincture.				
	80 p. c. tincture.	70 p. c. tincture.	60 p. c. tincture.	50 p. c. tincture.	40 p. c. tincture.	80 p. c. tincture.	70 p. c. tincture.	60 p. c. tincture.	50 p. c. tincture.	40 p. c. tincture.
1	·030	·034	·032	·030	·030	·52	·54	·54	·60	·61
2	·024	·026	·026	·024	·022	·52	·50	·56	·56	·55
*3	·021	·024	·023	·024	·017	·46	·51	·52	·52	·60
4	·030	·028	·027	·030	·029	·48	·58	·54	·52	·50
5	·028	·029	·028	·028	·026	·50	·61	·64	·78	·70
6	·020	·024	·025	·024	·018	·72	·74	·74	·78	·80
7	·026	·027	·0295	·023	·021	2·50	1·62	1·18	·74	·74
8	·021	·025	·0245	·019	·0205	1·76	1·46	1·24	·90	·70
9	·018	·019	·020	·015	·014	1·44	1·26	·92	·62	·52
10	·020	.023	·024	·021	·015	1·00	·96	·78	·68	·60
11	·021	·025	·023	·020	·018	1·34	1·14	·88	·74	·58
Average	·0235	·0258	·0256	·0234	·0209	1·02	·90	·77	·67	·64

Results of Estimation of Leaf-tinctures.

1	·012	·015	·014	·014	·013	1·60	2·08	2·20	2·46	2·34
2	·024	·028	·028	·028	·028	2·04	2·48	2·68	2·80	2·82
3	·022	·022	·023	·022	·022	1·90	2·04	2·68	2·94	3·08

* Series No. 3 was made from seeds gathered in 1889.

(*By E. H. Farr and R. Wright, " Pharm. Journ.," Jan. 16th,* 1892.)

ACANTHACEÆ.

Note on the presence of a Cholesterol in the roots of Hygrophila spinosa.

In the *Pharmacographia Indica,* one of us described the physical properties of a principle isolated from the roots of the *Hygrophila spinosa,* which was not unlike a cholesterol. Subsequently, through the kindness of Dr. Dymock, we obtained a large supply of the roots, and were able to separate a sufficient amount of the material to admit of its thorough purification and ultimate composition being determined.

For ultimate analysis the principle was crystallized from light petroleum ether, and the combustion made in an open tube in a current of oxygen. The tube had been in use some time and was in very good working order. The results obtained led to the following formula:—

		Calculated for $C^{26}H^{44}O$.	Found.
C^{26}	312	83·86	83·80
H^{44}	44	11·82	12·02
O	16	4·32	4·18
	372	100·00	100·00

At 175° C. (uncor.) the cholesterol commenced to soften, and melted at 184° (uncor.). The fusing point would appear to be higher than that of any cholesterol hitherto isolated. We were unfortunately unable to determine the specific rotatory power.

In purifying the cholesterol an alcoholic extract of the root was dried and exhausted with ether. The dry ether extract was treated with dilute sulphuric acid, and the insoluble residue taken up by ether. The ether extract was next boiled with aqueous caustic potash, the solution evaporated to dryness, and extracted with petroleum ether. The petroleum ether extract was boiled for some hours with alcoholic potash, the solution evaporated to dryness, and extracted with petroleum ether. The petroleum extract was of a yellow colour, and in order to decolourize it, it was dissolved in absolute alcohol, and the solution agitated with purified animal charcoal; this, however, failed to remove the whole of the colour, and the following experiment was adopted. The alcohol was evaporated off, the residue dissolved in petroleum ether, and the solution agitated with proof spirit; by this means most of the colouring matter was removed. The cholesterol was finally several times crystallized from petroleum ether, and was obtained perfectly white. A benzoyl derivative was also prepared. Evaporated with a drop of nitric acid and the dry residue moistened with ammonia, an orange colour developed, but no change was induced by the addition of caustic potash. The violet reaction with ferric chloride and HCl applied as described by Forti was very marked. The sulphuric acid and chloroform reaction was conducted in a stoppered bottle; the chloroform layer at first became yellowish-brown, then blood-red, finally darkening to reddish-purple; the sulphuric acid and stratum was of a pink colour, and in some experiments fluoresced. (*By C. J. H. Warden, and Assistant Surgeon C. L. Bose, Assistant Chemical Examiner to Government of Bengal.*)

LABIATÆ.

Salvia macrosiphon, *Boiss.*

The Kanocha seeds referred by us (Vol. III., p. 265) to *Phyllanthus madraspatensis* have been shown by Dr. O. Stapt to belong to a species of Salvia. Dr. Stapt bought the drug in the bazaars of Ispahan, where it was known by the Persian name Marv. A drug called "Merw" was mentioned by Abu Mansur in 1055, and Seligmann refers it to *Origanum Marv*, L., a native of Syria. Aitchison, in his *Notes on the Products of Western Afghanistan*, mentions "Salvia (?)" as the origin of the nutlets known as *Kanoucha* or *Kanouncha*. (*Pharm. Journ.*, March 11, 1893.)

Influence of Menthol on the gastric functions.*

Following Professor I. T. Tchüdnovsky's suggestion, Dr. Vladimirsky has carried out a set of experiments on seven healthy subjects (six men, including himself, and one woman), aged from 24 to 32, the drug being administered with food, in the dose of 0·3, 1·0 and 2·0 grammes. The author has arrived at the following conclusions:—

(1) The drug (in any of the doses stated) very markedly diminishes the proportion of free hydrochloric acid in the gastric juice, the decrease attaining its maximum in about 1 or 1½ hours after the ingestion.

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* *St. Petersburg Inaugural Dissertation*, 1891, No. 77, p. 44; *Medical Chronicle*, August, p. 367.

(2) In persons presenting a more or less weakened motor power of the stomach, the decrease lasts longer than in those with a normal one.

(3) The digestive power of the gastric juice is diminished.

(4) The transformation of proteids into peptones is retarded (hence an increased proportion of propeptones, *i.e.*, intermediary products of peptonisation).

(5) The proportion of lactic acid in the gastric juice is augmented, the rise proceeding parallelly with diminution in the proportion of free hydrochloric acid.

(6) The motor power of the stomach grows weaker (in about one hour after the ingestion); in initial stages of the digestion, however, it may occasionally undergo some increase.

(7) The absorptive power of the organ improves, which seems to be dependent upon a favourable (stimulating) influence of menthol on the circulation.

(8) Contrary to the statements of Ossendowski (*vide* the *Journal of Laryngology and Rhynology*, May, 1890, p. 202), L. Braddon, M. Reichert, S. Rosenberg, Hugo Koster, and many other observers, menthol does not appear to possess any special "appetite-making" power.

(9) In 1 and 2 gramme doses, the remedy gives rise to a kind of intoxication, followed, in 4 or 5 hours, by sensations of languor and drowsiness.

(10) Menthol may prove useful as a substitute for camphor. (*By Nikolai A. Vladimirsky.*)

Ustukhadus and Gul-i-sirwaj.

We have received from Afghanistan, under the name of *Ustukhudus* (Stæchas), the flowering tops of a labiate plant which appears to be a *Moluccella*; it has enlarged purple calices and Balm-like odour.

In the same parcel we received, under the name of *Gul-i-sirwaj*, the large rose-coloured calices of *Hymenocrater elegans*, Bunge, containing the ripe nutlets; the calices have an agreeable aromatic odour and are mucilaginous.

ARISTOLOCHIACEÆ.

Aristolochine and Aristin.

These two substances have been obtained from the roots of *Aristolochia argentina* by Dr. O. Hesse, who gives the following account of them (*Pharm. Journ.*, Jan. 9th, 1892):—

The powdered root gives a dark brown yellow colour to ether, and when gaseous ammonia is added to the ethereal solution a red flocculent precipitate is separated. The ether solution separated from this precipitate gives on evaporation a yellowish-brown residue, in which clear, colourless crystals are formed after some time. The dark-coloured mass separated from these crystals and again dissolved in ether gives, on shaking with dilute sulphuric acid, a small quantity of a base. The greater part of it, however, remains in the root that has been treated with ether, and can be extracted with alcohol. On evaporating the alcoholic extract a brownish-yellow resinous residue is obtained that is partly dissolved by caustic soda solution and gives up the base to ether.

I propose to apply the name Aristin to the substance contained in the above-mentioned red ammoniacal compound. When that compound is dissolved in hot glacial acetic acid, the aristin crystallizes out on cooling, and it can easily be obtained in a pure state by recrystallizing from hot glacial acetic acid. Aristin forms shining gold-coloured laminæ and flat needles sparingly soluble in hot glacial acetic acid and scarcely at all soluble in the cold. It is sparingly soluble in hot alcohol, more so in ether, chloroform, or benzene.

At about 260° C. it blackens, but does not melt until the temperature reaches 270° C., and then undergoes decomposition. It dissolves in concentrated nitric acid on boiling for a short time, and separates again unaltered on cooling; but when the boiling is long continued decomposition takes place with evolution of red vapour. Aristin dissolves in acetic anhydride with a yellow colour, and when concentrated sulphuric acid is dropped into the solution it becomes at first intensely blue and then permanently greenish-blue. The alcoholic solution of aristin has a perfectly neutral reaction, but the substance combines with ammonia and with soda. These compounds have a fine red colour, and the ammonia compound can be crystallized from alcohol in delicate needles. Both compounds are dissolved by water or alcohol with deep orange-red coloration. On addition of acids to these solutions a flocculent yellow precipitate is thrown down which soon becomes crystalline.

The second of the above-mentioned compounds is a fat acid ester that can be easily purified by recrystallization from alcohol. It takes the form of small white laminæ which melt at 84° C., and are very soluble in hot alcohol, but sparingly in cold alcohol, very soluble in ether, pertroleum spirit or chloroform, and insoluble in water.

The substance dissolves in hot glacial acetic acid, and on cooling crystallizes out again unaltered. In the alcoholic solution this substance can be easily saponified, the products being phytosterin and palmitic acid.

The third substance mentioned above is a base, to which I propose giving the name Aristolochine. That name has already been applied by Chevallier to a bitter substance obtained from *Aristolochia serpentaria*, but it was obviously a mixture the bitter taste of which was probably due to the presence of the base now described. Therefore, the name seems to me to have been inappropriate in that instance, and I have transferred it to the pure substance.

Aristolochine is precipitated from its colourless solutions in sulphuric or acetic acid on the addition of ammonia or caustic soda in the form of white amorphous flocks. It is freely soluble in alcohol, ether, chloroform, or benzene. On evaporating the ether solution it remains as a colourless resinous mass. When the ether solution is mixed with an equal volume of petroleum spirit and the mixture very slowly evaporated, warty masses are deposited that are distinctly crystalline. The base has a bitter taste and neutralizes acid perfectly. The hydiodide and sulphocyanide are amorphous oily precipitates which present no tendency to crystallize. The platinochloride is a dark yellow and the aurochloride a pale yellow amorphous precipitate; both are almost insoluble in water.

The behaviour of the base with concentrated sulphuric acid is remarkable. It forms a fine green solution, which becomes bright bluish-green on the addition of a trace of ferric chloride. Similar reactions are given by aricine, cusconine, and some of the bases of the bark of *Remijia purdieana*.

Aristolochine appears to have been already observed by Dymock and Warden in their examination of *Aristolochia indica*, and I am of opinion that the differences of their statements in regard to the base are solely due to their having failed to separate it completely from colouring material. I am also of opinion that aristin partakes of the nature of the yellow substance* obtained by previous observers, and that, according to some remarks of Dymock and Warden, it is probably present in the root of *Aristolochia indica.*

Aristolochin is the name given by Dr. J. Pohl to the active principle of the seeds of *Aristolochia Clematitis* and the roots of *A. rotunda* and *A. longa.* The powdered drugs were exhausted with petroleum-ether, which removed chlorophyll, oil, and a gelatinous, nitrogenous, inactive substance (occasionally this can be obtained crystalline); warm 96 per cent. alcohol removed the colouring and bitter principles; after evaporating to syrupy consistence it was taken up with water and acidulated with sulphuric acid, the precipitate collected, expressed, dried at 40° C., and extracted in a Soxhlet apparatus for some weeks with petroleum-ether until the last traces of the above-mentioned nitrogenous substance were removed and the residue exhausted with alcohol or ether; from this alcoholic or ethereal solution there separated after a time yellow crystalline masses, which, recrystallized several times from ethereal solution, were found to constitute the active principle. It is soluble in chloroform, ether, acetone, phenol, acetic anhydride, aniline, and alcohol; almost insoluble in cold water, slightly soluble in warm water; insoluble in pertroleum-ether, benzol, and carbon disulphide; alkalies and alkaline-earth hydrates dissolve it; from neutral or alkaline solutions it is precipitated by neutral and basic lead acetate, dialyzed iron, zinc sulphate, silver nitrate, and a saturated solution of salt, but not by alum, copper sulphate, and platinic chloride; it does not reduce Fehling's solution and does not react with Millon's reagent. Its ultimate analysis, C 59·98, H 3·54, N 4·32, O 32·16, leads to the formula $C^{32}H^{22}N^{2}O^{13}$. Physiologically it was found that cold-blooded animals were entirely indifferent to it; while in warm-blooded animals uræmic intoxication was produced; in this respect aristolochin is a much more powerful agent than any other substance; it resembles aloin in its action upon the kidneys, but is about ten times more poisonous—it is probable that given to man it may act as a cathartic (*Arch. f. exper. Pathol. u. Pharm.*). (*Apoth. Ztg.* 1891,642.)

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* See *Pharm. Journ.*, li., 245.

LAURINEÆ.

Gum-barks.

Gum-bark, or *Pishin-puttai* of the Tamils, does not refer to the bark of a tree which exudes a gum by bruising or incision, but denotes a bark which has such mucilaginous properties that it could be used for special purposes in medicine and the arts, where the white of egg would be used elsewhere. Barks of this description occur in the natural orders Malvaceæ and Laurineæ, and students of materia medica know that drugs of these orders, marsh-mallow root, and the barks of arboreous cinnamons, for instance, contain a peculiar mucilage, which is not precipitated by alcohol. A typical gum-bark of the East is that of *Kydia calycina*, a malvaceous tree, growing extensively on the slopes of the Nilgiris, and largely employed in sugar refinery under the Tamil name of *Kadularangy-puttai.* On soaking a portion of this dried bark in water it rapidly swells, and the inside becomes coated with a slimy mucilage. The inner layers of the liber may then be removed like pieces of lace, and the gum is seen to be occupying the spaces between the longitudinally disposed fibres, apparently formed from the cellulose of the broken cell-walls. The bark of Kydia is sold in the bazaars, and the decoction is taken as an astringent and tonic, and the Vythians or native doctors consider it to be a specific for diabetes.

Dr. Mohideen Sheriff, in the "Supplement to the Pharmacopœia of India," gives *Tetranthera Roxburghii* as the botanical origin of *Pishin-puttai*, but offers no description of the drug under that heading. Mr. Hollingsworth, of the Madras Medical College, some time ago supplied me with an authentic specimen of the bark of *Tetranthera laurifolia*, or, as it is now called in the "Flora of British India," *Litsæa sebifera.* The bark was of a reddish-brown colour and slightly balsamic odour, very different to that of cassia or cinnamon. The thickness was a quarter of an inch, and when soaked in water it became very mucilaginous. It afforded, on analysis, distinct reactions for an alkaloid, which had the characters of laurotetanine, a poisonous base lately discovered by Dr. Greshoff in the barks of several species of Javanese lauraceous plants.

About two years ago a collection of drugs for identification was sent to me by Dr. P. S. Mootooswamy, of Tanjore, and among them was a specimen of *Pishin-puttai*, which, he said, was collected from trees growing in the jungles near Point Calimere. This bark had a most agreeable odour, resembling, but not identical with, Indian cassia, and the taste was decidedly sweet. It made a slimy mucilage when mixed with water and contained some tannic acid, but no alkaloid resembling laurotetanine could be separated from it. The bark is sold in the bazaars, and it is known as *Mydalakady* among Muhammadans. It is used in medicine for its mucilaginous, demulcent, and refrigerant properties. By powdering the bark with some benzoin, mixing it into a paste with a little water, and smearing this on reeds, and drying them in the sun, flavouring sticks called *Samboorany-vathe* are made, and are burnt as an incense or perfume. I have not been able to obtain the botanical source of this particular variety of gum-bark, but I am inclined to believe from its odour that it is an arboreous cinnamon.

From Travancore I have received on different occasions three specimens of gum-bark, all varying the one from the other. The first was a thick, red-coloured bark, a commercial article on the Western Coast, supplied to sugar refiners. The botanical origin could not be ascertained; it differed in physical characters from the barks previously mentioned, and yielded an alkaloid having the reactions of laurotetanine. Probably it was a Litsæa. The second description of gum-bark was that of *Kydia calycina*. The third specimen was sent by the Conservator of Forests for Travancore; it was named in Malyalum *Ava-tholi*, and derived, it was supposed, from a species of Cordia.

I have recently examined some samples of gum-barks from the Madura District of Southern India, and stated to be used by the hill villagers in increasing the alcoholic strength of sago toddy. The plants yielding these barks were up to this time only known by their vernacular names, but as leaves, flowers, and fruits were also sent, these enabled them to be identified. The request was also made that they should be analysed to ascertain the nature and effect of their use in native spirit manufacture.

The seven specimens of bark were as follows :—

1. Kadaly-marum*	*Olea glandulifera.*
2. Koppa-marum	*Litsæa Zeylanica.*
3. Karukathan-gundu*	*Hiptage Madablota.*
4. Mullu-gundu	*Jasminum flexile.*
5. Pungala-marum	*Ligustrum Roxburghii.*
6. Sudala-marum	*Litsæa Wightiana.*
7. Kumala-marum	*Gmelina arborea.*

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* Marum = tree, gundu = climber (Tamil).

The *Olea glandulifera* is a stout, tall tree, with white flowers and small black fruit. The bark is of a greyish colour, with whitish specks, about $\frac{1}{6}$ of an inch in thickness, breaking with a close granulated fracture, inner surface brown.

The *Litsæa Zeylanica* is a moderate-sized tree, with yellowish-white flowers and black fruit; the leaves are ribbed and whitish on the under surface. The bark is gray and covered with lichens, smooth, $\frac{1}{6}$ of an inch thick, fracture close, showing white, glistening fibres running through the red substance of the middle and inner layers, brown and smooth internally. The bark gives off a fragrant odour when burning.

The *Hiptage Madablota* is a woody climber, reaching to the top of trees over 100 feet high. The stems are from half to three-quarters of an inch in thickness, and covered with a thin, smooth, reddish-brown bark enclosing a yellowish wood.

The *Jasminum flexile* is also a climber. The stems are about one inch in diameter, very woody and knotted, covered with a light yellowish-brown papery bark, exfoliating on the surface.

The *Ligustrum Roxburghii* is a stout tree about 50 feet in height. The bark is coloured russet-brown, and is a quarter of an inch or more in thickness; fracture close, showing thick white fibres running through the brown middle and inner layers.

The *Litsæa Wightiana* is similar to *L. Zeylanica* in many respects. The bark has a greyish-green epidermis, beneath which is a chocolate-coloured surface; the fracture is short and light coloured, becoming red or brown by exposure to the air.

The *Gmelina arborea* is a common tree in the plains. The bark is about half an inch thick, with a rugged, black and yellowish-brown surface, middle layer hard and brown, fracture granular, ochreous within.

Some documents accompanying these specimens stated that the barks of these trees were used "to increase the intoxicating effects of sago toddy." The bark is simply placed in the toddy and left there for two or three days. The bark No. 3, it is said, is not so frequently used, as the resulting liquor causes headache when drunk. With reference to No. 7, it was said that a tenth part of it would answer the purpose in the absence of other barks.

It will only be necessary to give the results of the chemical examination of these barks, in so far as they are likely to explain their action in the fermentation of sugar. Three of the plants curiously enough belong to the natural order Oleaceæ; these are *Olea glandulifera*, jasminum and ligustrum, and like other plants of this order contain a peculiar bitter principle, soluble in water and alcohol, and a yellow colouring matter called quercetin. Two other barks of the series belong to the same natural family of the laurels, and have a similar composition; these are the Litsæas. The Hiptage bark contains tannin, and is simply an astringent; and the Gmelina belongs to a class of plants distinguished for their bitterness.

The amount of extract dissolved out of the bark by water and alcohol respectively were determined in order to ascertain their relative proportion, as it would seem that in the absence of much resin, the excess of water extract over the spirit extract would indicate mucilaginous matter, and on the barks being placed in the toddy, which, in a fresh state is a watery solution of sugar, with some albuminous matter, the extract would dissolve, but as fermentation proceeded, alcohol would be formed and the mucilage would become insoluble and precipitate, carrying down with it the viscid albumen, and thus allow the sugar to ferment more rapidly. From the fact that other gum-barks besides the Litsæas, such as *Kydia calycina* and *Guazuma tomentosa*, are largely used in clarifying sugar, it is evident that some such object as this is intended in their employment. The astringent qualities of most of the above-mentioned barks are no doubt used for the purpose of forming insoluble compounds with albuminous matter in saccharine solutions; just as hops are used to remove this substance from malt liquor in the ordinary process of brewing beer. The hops are found to prevent in a great measure the tendency of the beer to become sour, in consequence of the conversion of alcohol into acetic acid, and in warm climates where such liquors are apt to run into the acetous fermentation very rapidly, it is necessary to employ astringent drugs to regulate the formation of alcohol and prevent the development of acetic acid.

The natives consider these barks a necessary ingredient in making spirit, for the following reasons: Firstly, they diminish the great sweetness of the toddy sugar. Secondly, they render the spirit more intoxicating. The first of these phenomena is accounted for by the chemical fact that sugar breaks up during fermentation into two other bodies, alcohol and carbonic acid; and in the second place the barks enable the operator to obtain a larger proportion of alcohol from his toddy than he could get from leaving it to brew without such adjuncts. The analyses of the barks, with the exception of the Litsæas, which contain laurotetanine, has revealed no principle of poisonous or intoxicating properties, therefore the idea of their directly communicating a potency to the spirit is not sufficiently established, and, besides, as the spirituous liquor is submitted to distillation afterwards, any alkaloid, such as strychnine, would be left behind in the retort. Some of the barks are aromatic, and these most likely are used to flavour the resulting spirit, which would be the case if the aroma resided in a volatile oil. It is probably a spirit of this kind that Dr. Ainslie refers to under the title of *Puttaicharagum*, or bark-spirit, an alcoholic liquor in which barks of various acacias are used in the manufacture. (*D. H.*)

Formosa Camphor.*

Formosa camphor is obtained from the *Laurus camphora*, immense forests of which extend over most of the lower ranges of hills in the island, extending up the lower slopes of the mountains inhabited by the savage tribes. Many of these forests have not been touched, and the statement that the camphor supplies in South Formosa are becoming exhausted, applies only to those districts which are purely Chinese. The supply from other parts is practically inexhaustible. Even in purely Chinese districts it is only at certain places that the supply is falling off in consequence of the reckless manner in which the trees have been destroyed, partly for the sake of the timber and camphor, and partly, no doubt, simply to clear the ground for cultivation.

It has been often stated that the method of obtaining crude camphor in Formosa is by steeping the chopped branches in water, and boiling until the camphor begins to adhere to the stick used for stirring, when the liquor is strained, and by standing the camphor concretes. By this method it does not necessarily follow that the tree is destroyed; in fact, with a little care there is no need that it should be. But although this method may have been in use in former days, it certainly is not now. On the contrary, I am assured by several natives, engaged in the trade, whom I have questioned on the subject, that the yield of camphor from the branches is too small to repay the labour of extraction.

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* From a report by Mr. Consul Warren on the trade of Tainan, Formosa.

The method in general use now is as follows:—The camphor expert selects a tree and scrapes into the trunk in different places, using an instrument somewhat resembling a rake, with the view of ascertaining whether it contains sufficient camphor to repay the labour of extraction. A tree is said not to be worth anything for camphor purposes until it is fifty years' old, and the yield is very unequal; sometimes one side only of the tree contains enough camphor to satisfy the expert, and in this case that side alone is attacked. The trunk is scraped to as great a height as the workmen can conveniently reach, and the scrapings are pounded up and boiled with water in an iron vessel over which an earthenware jar, specially made for the purpose, is inverted. The camphor sublimes and condenses on the jar, which is removed from time to time, scraped, and replaced. The root of the tree and the trunk, for some eight feet up, contain, as a rule, the greatest quantity of camphor. If the scrapings obtained from the trunk yield well, the chipping is continued until in the end the tree falls. The roots are then grubbed up, as it is certain they will give a proportionately good return. If, however, the scrapings do not turn out well, the tree is abandoned, and work is commenced on another. No attempt is made to extract camphor from the fallen trunk or from the branches. In some cases, the trunk is sawn up into timber, but this depends on the locality; from many districts, owing to absence of roads, timber would not pay for its transport.

It is impossible to imagine a more wasteful method of procedure, and it is fortunate that the camphor forests of Formosa are practically inexhaustible.

The quantity of camphor produced depends, of course, simply on the amount of labour employed in the business. Ten of the iron pots mentioned above and their accompanying jars make up what is called a "set," and are worked by four men. One set will produce about 65 lbs. in ten days, or, say, 1¾ cwt. a month, but this only under the most favourable circumstances; a fair average is about 1¼ cwt.

Recently a change has been made in the camphor monopoly. It is now proposed by the Chinese authorities that the camphor stills should be licensed before they are permitted to work. The cost of the license will be equivalent to a tax of about 22*s.* 6*d.* per cwt., a heavy tax, seeing that the actual value of the camphor at the place of production is very little over this amount. (*Pharm. Journ.* June 13th, 1891.)

EUPHORBIACEÆ.

Phyllanthus Niruri.

The bitter principle of this plant, which we provisionally named *pseudo-chiratan*, has been examined by M. Ottow (*Nederl. Tijds. voor Pharm.*, 1891, 3, 128), who calls it *phyllanthin* and gives its chemical composition as $C^{30}H^{37}O^{8}$. It crystallizes in colourless needles or flakes, possesses an intensely bitter taste, and is almost insoluble in water, but easily soluble in alcohol, petroleum ether, ether, chloroform, benzene, and glacial acetic acid. At 200° C. it is volatilized and condenses in the upper part of the vessel as an amorphous mass, but in a few days this amorphous deposit changes to the crystalline state.

Manioc or Cassava.

From the brief allusions to this substance by writers on Materia Medica, one would get but a slight idea of its importance as an article of diet in tropical countries, being the staple-food for unnumbered millions of human beings—the staff of life in the West Indies, Brazil, and on the Continent of Africa.

The plant from which this food is derived is known to botanists as *Janipha Manihot*, and is a shrub six to twelve feet high and one or two inches in diameter. Except for the young leaves, which are used as greens, its whole value consists in its tuberous roots, which sometimes reach the enormous weight of thirty pounds, but usually range from one to three inches in diameter and from six to eighteen inches in length. The shrub is said to be a native of Brazil, where it is known as Mandioca or Tapioca. Cassada (or Cassava) is its name in the West Indies. It is not grown from the seeds, but from cuttings, having surprising vitality; for a cane of it, like Aaron's rod, will bud and grow leaves in your hand. Hence, it is only necessary to cut the stick into pieces of six to twelve inches in length, and thrust them into the ground, and it matters little whether the ground has been first broken for it or not. In eight to eighteen months the tubers are in their best state to produce the nutritious food—seventy per cent. gluten and thirty of starch; but, at a later period, the gluten becomes less and the starch increases. There is no food-product which compares with it in resisting drought. Even in the dryest seasons, it is like other trees "planted by the rivers of water," and whole fields are green with its foliage, while all else is brown with the scorching sun.

There are two varieties of the manioc, known as the sweet and the bitter; the first of which may be eaten with impunity, while the latter has a bitterish, milky juice, which is poisonous from containing prussic acid. But these roots are grated or otherwise reduced to a pomace, and then suspended in grass bags, when the poisonous juice drips out, or, being volatile, is dissipated by the heat in baking bread from it. The bitter variety is the principal kind used in British Guiana, while the sweet is the one mostly cultivated in Africa. The tapioca which comes into our houses is almost pure starch, and is made from the expressed juice of the root, which, on standing, deposits in the form of powder, and which, if dried without heat, will remain so. If heat be applied, it takes the form of the irregular masses we are accustomed to see.

The root has the taste of chestnuts, and may be eaten raw. It is delicious, wholesome food when roasted in hot embers or broiled. If soaked till the skin can be drawn off and the fibrous heart drawn out and then dried, it makes good bread; or, if broken up and fried in palm oil and salted, it is a good relish, and the Africans call it *bomba.*

An extremely white and fine flour, called *fuba*, is made from the soaked and dried roots, and it is the chief food in Angola.

The flour makes a thick porridge or mush—*funje.* The water is boiled and salted and set off the fire; after which *fuba* is stirred in until it can be cut into blocks, which may be taken in the hands and eaten with molasses or dipped into chicken broth.

The staff of life on the Congo is *quanga*, or bread made from the manioc by soaking, peeling, and pounding the soaked root into a pomace, and kneading and making into dough-loaves of four by six or ten inches. These loaves are wrapped in thin, tough leaves and bound, and then boiled in large earthen pots. Then the bread is ready for use; or it may be sliced and browned or broiled, as one prefers.

Farina from the manioc is prepared by grating the green root, drying in the sun, with all the starch and tapioca in it, browning it slowly over the fire; after which it is eaten by stirring it into soup or boiled beans.

Grate, strain, and dry slowly in the sun, and you have a starch for puddings or any other purpose for which starch has demand in the market. Gluten being a nerve-food, indispensable to health and vigour of both body and mind, the great abundance of it in the Cassada—nearly three times as much as in wheat flour—the Cassada is pre-eminently "the staff of life," since there is no way by which its abundance of gluten can be wasted in preparation, as in wheat. There is a Providence here which shapes ends, since this chief food for tropical regions has so much nerve-supplying elements and so little of the heating elements, as compared with food in colder climates.

But this abundant gluten, as compared with other foods for the sick, pre-eminently fits it for the sick-room, and especially so when we wish to increase strength instead of heat, and where any irritating and indigestible food-substances are forbidden. It requires longer boiling than starchy foods in general, and may be used in the form of thin mucilage or demulcent, or in a more solid form with sugar, lemon juice, nutmeg or other aromatics. I suspect that, as physicians, we should make immense gain in restoring from prostrating sicknesses by using more of this eligible substance in place of so much meat slops, and especially so in cases complicated with more or less gastric irritation. Meat foods must be excluded from the stomach in gastric ulcer. Why not, then, fall back upon this highly nitrogenous food for supporting the strength? Having so large a proportion of gluten over the starch, it offers immense advantages over wheaten and other bread in cases of diabetes where any starch at all is allowable. (*By E. Chenery, M.D., of Boston, "The Times and Register,"* April 5th, p. 318.)

In the Cox's Bazar district, Bengal, the tuberous roots are used by the Maghs in the preparation of a spirit.

A false Kamala.

Mr. Henry G. Greenish has examined a sample of Kamala from Bombay, and found it to have been carelessly collected, and mixed with badly preserved safflower and other extraneous matter, and reduced to coarse powder. (*Pharm. Journ.*, March 11th, 1893.)